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The Masaryk Academy of Work.

By Paul M. Atkins

How Czechoslovakia is using engineering thought to solve national problems—Waste elimination is being given governmental attention

OF ALL the new nations that came out of the welter of the world war, there is little question but that the Czechoslovak Republic has made the greatest progress towards establishing itself on a sound economic, social and political basis. The traveler in that country can find many indications of this and among them not the least important is the Masaryk Academy of Work, so named in honor of the much beloved and honored president of the Republic. This organization is at one and the same time an evidence of the progress being made and an instrument toward that end.

The beginnings of the Masaryk Academy of Work date back to the time of the world war. At that time the Czech engineers urged the Czech Academy of Sciences and Arts at Prague to add a fifth section for science and engineering, to the four that already existed. After detailed consideration of this proposal, however, the Academy decided not to accede to it. The engineers were not to be gainsaid and in the autumn of 1917 began the organization of the Engineering and Economic Union which was finally founded on the 28th of October, 1918, the day when the Czechoslovak Republic began its official life as a nation. The avowed object of this Union was to put the work of the nation on a scientific basis.

After the war was over, these men were joined by others and the scope of the project was somewhat modified and enlarged. The problem confronting them was a difficult one because it involved the organization of an institution in which both scientific specialists and practical men of affairs would co-operate toward a common end. The undertaking received the enthusiastic support of President Masaryk who took the first steps toward giving it financial stability by presenting to it 1,000,000 Czechoslovak crowns (the crown is worth about 3½ cents) a part of a gift sent to him by the Czechoslovaks of America to be used at his discretion for the welfare of the country. Soon afterwards the Masaryk Academy of Work was duly incorporated by a special act of the National Assembly in the following brief terms:

1. The Masaryk Academy of Work is an independent and self-governing scientific institution located in Prague. Its function is to organize the technical work in connection with the economic exploitation of the capacities of the whole population and the natural wealth of the Czechoslovak State in the interest of the highest degree of prosperity for all.

2. The organization of the Masaryk Academy of Work will be in accordance with the special statutes duly enacted.

One third of the original members will be nominated by the government.

The President of the Republic will confirm the appointment of the Director of the Masaryk Academy of Work and of his deputies.

The State has the right to inspect the administration of the Masaryk Academy of Work.

3. This law is effective from the day of its enactment. It will be put into execution by the Ministry of Schools and National Instruction in agreement with the other ministries.

ONE OF the most significant factors in the market for machinery is the recent rapid revival of foreign business. The Dawes Plan is apparently bearing fruit in restored confidence, if in nothing else. American manufacturers will do well to pay close attention to their foreign markets and in particular to watch the development of the new Czecho-Slovak Republic. Here is a European nation that takes its engineers seriously and is forging ahead proportionately.

The author of this account attended the International Management Conference at Prague and studied the workings of the Masaryk Academy of Work. What he has to say about it will give you a clearer picture of the situation in this very young republic.

For the data contained in this article I am indebted to a paper by Dr. Ing. B. Tolman, General Secretary of the Masaryk Academy of Work, presented at the Prague International Management Congress, July, 1924.

The subsequent statutes enacted in accord with the Article 2 above define the duties of the Masaryk Academy of Work specifically as follows:

(a) To further the systematic study and scientific organization of technical work, paying attention to its efficiency and economic functioning;

(b) To support scientific research in all branches of technical work;

(c) To encourage the training of scientific research workers and instructors, the study of the ethics and rights of labor, and the training of scientific organizers of work;

(d) To protect and support the initiative of the Czechoslovak people, chiefly by investigating new manufacturing processes, branches of commerce and commercial relations and by training workers with the necessaary abilities; to protect and support inventors;

(e) To take part in the fundamental solution of the technical duties of public administration by presenting plans and criticisms of existing plans;

(f) To instruct the people in regard to the object of work, its value and importance, economic application and uses.

In addition to the preceding duties it has also the following rights, according to the statutes:

(a) To organize public lectures and other means for gaining public support for its endeavors, both at home and abroad;

(b) To publish and issue its literature;

(c) To organize exhibitions and other similar enterprises;

(d) To arrange and maintain relations and cooperation between various workers and analogous corporations at home and abroad;

(e) To establish special undertakings that would work according to the spirit of the Masaryk Academy of Work, affiliate them with the Masaryk Academy of Work and administer them;

(f) To found a Union of Friends of the Masaryk Academy of Work in order to obtain support for the entire range of its activities.

It may be readily seen from the foregoing outline that the Academy has the broadest powers to carry on research work and to promote the application of its findings to the practical needs of the economic life of the country. It should be noted in this connection that the Czechoslovaks have a very vital interest in organized endeavor for the first steps toward forming this Academy were taken before the republic had a recognized existence. They are rapidly becoming one of the best nations of organizers in the world. The emphasis which is laid on "work"—the word is a part of the name of the Academy—is also noteworthy for it indicates that the nation is alive to the fact that progress and success do not come as the result of mere discussion but only as the outcome of mental and physical effort. The typical Czechoslovak of today is hard-working and the results of his labors are already being seen in his land. Still another point mentioned in the foregoing paragraphs deserves attention. It is that the Czechoslovaks are alive to the fact that material progress must be linked with an adequate realization of the necessary social and ethical growth of the nation.

There are two classes of memberrs of the Masaryk Academy of Work: (1) Scientific experts and (2) members of the scientific council. The first class is to be chosen from among specialists in various branches of science and work, while the second is to be elected from among those who have done especially good work in scientific research or creative activity of any kind. Members may be chosen from among Czechoslovak citizens of either sex, and, with the permission of the Ministry of Foreign Affairs, from among foreigners, but such members do not have the right to vote.

The scientific experts are divided into sections and the scientific council into similar sub-committees. The number of such sections and sub-committees is fixed by the scientific council according to the needs of the Academy. The experts are elected for a period of six years and are eligible for immediate re-election. Their number is not limited. The members of the scientific council are elected for life and their number must not exceed ten for each section or sub-committee. They form, therefore, the élite of the Academy and an election as a member of this council is one of the greatest Czechoslovak honors.

The first sixty members (scientific experts) were chosen by the government after a preparation committee had made its report. Before the end of the first month after their selection these sixty had the task of selecting sixty additional members. From this nucleus the membership has grown to 247 of whom 42 are now members of the scientific council. The foreign membership numbers 15 and it is of particular interest to Americans to note that all their foreign members are Americans.

The statutes of the Academy have determined the method for the election of additional members, outlined the scope of the various sections, sub-committees and central committee and defined the tasks of the curator's department which has charge of the adminstration of the property of the Academy.

It has already been mentioned that the Academy is divided into sections. At the present time there are six of them:

I. Natural History and Medicine,
II. Agriculture and Forestry,
III. Building and Engineering,
IV. Machinery and Electrical Engineering,
V. Chemistry and Technology,
VI. Economics and Social Questions.

Each section elects its chairman, two deputy chairmen and two secretaries; the chairmen of all the sections form the Central Committee which is the co-ordinating body of the organization.

The Scientific Council elects a chairman or president, who is also the director of the Academy, and a general secretary. Each section elects its own chairman who also acts as a deputy of the director. The director, the section chairmen and the general secretary form the executive committee which carries on the current administration of the Academy and supervises the putting into effect of the decisions of the scientific council. All of the above elections are for periods of three years. In the case of the director and the section chairmen, the elections are not valid until ratified by the President of the Republic.

The internal organization of the Academy is rather heterogeneous, each section laying out its work in the manner which seems best adapted to its easy and thorough accomplishment. One section, for example, works as a body and is not as yet subdivided in any way. The other sections, in general, have divided their tasks among several commissions and institutes, while in certain cases much of the work of a section is carried

on by independent institutions which have been affiliated for this purpose with the Masaryk Academy of Work.

Moreover there are certain activities which have a vital interest for two or more of the sections as they are now established. In order to carry on these activities effectively, inter-section commissions and institutes have been set up. The establishment of commissions or institutes requires the approval of the scientific council, and their work is regulated by rules prepared by the council. As the seat of the Academy is at Prague, most of the work is done there; but to facilitate the co-operation of members living in Moravia, Silesia and Slovakia certain sub-commissions have been established at Brno. These sub-commissions are essentially extensions of the commissions meeting at Prague and their work is integrated with that of the main commissions of the Academy. The organization of the Academy is shown in the accompanying diagram.

CHAIRMAN							
General Secretary							
Bookkeeping Dept	Manager's Office	Treasurer's Dept.					
CURATOR'S DEPARTMENT							
SCIENTIFIC COUNCIL							
Sections:	I Natural History and Medicine	II Agriculture and Forestry	III Building and Engineering	IV Machinery and Electrical Engineering	V Chemistry and Technology	VI Economics and Social Questions	
CENTRAL COMMITTEE							
Sections:	I Natural History and Medicine	II Agriculture and Forestry	III Building and Engineering	IV Machinery and Electrical Engineering	V Chemistry and Technology	VI Economics and Social Questions	Inter-Section Institutes and Commissions
Institutes:	Institute for Practical Ornithology					Psychotechnical Institute	Czechoslovak Research Union for Testing Technically Important Materials and Construction
						Town-Planning Institute	Institute of Engineering and Industrial Management
						Institute for Economic Relations With Immigrants and Colonisers	Institute For Silicate Research
Commissions:	Commission for Eugenics and Demography	Commission for the Economization of Agricultural Work	Commission for the Research and Testing of Buildings and Building Materials		Commission for the Exploitation of Atmospherical Nitrogen		Commission for Fuel Research
	Commission for Nation Study		Commission for Studying Economic Methods of Work in the Building Trades				Commission for the Democratization of Training
	Commission for Radio-Telegraphy		Department for the Experimental Water Power Institute				Commission for Drawing Up An Inventory of Quarries
			Commission for Standardization				Commission for the Preparation of A Project for New Building Regulations
			Commission for the Collaboration of Engineers in the Defense of the Country				
			Commission for the Protection of Engineering Constructions				
			Commission for Alterations in Salaries				
	WORKING COMMISSION FOR MORAVIA AND SILESIA IN BRNO						

The Organization of the Masaryk Academy of Work

Section I of the Academy is devoted to natural history and medicine. Work so far has been largely devoted to the fields of botany, geology, ornithology, biology and dermatology. An institute for practical ornithology has been established, and commissions for eugenics, and for what appears strange to American eyes under such a section, for radiotelegraphy, for nation study and for demography.

The work of section II is carried on largely through a related organization, the Union for Agricultural and Industrial Research in the Czechoslovak Republic. It has established a commission to study ways and methods for carrying on agricultural work in the most economical fashion possible. It may well be noted in this connection that the Bohemian and Moravian portions of Czechoslovakia are largely rich and fertile agricultural territory, capable of producing immense crops, and that at the present moment, agricultural methods are on a distinctly high plane. There are many farms on which the work is done in a highly scientific fashion and there is much which Americans farmers can learn from Czechoslovak farming. This section is also concerning itself with the problem of land distribution and other related reforms, matters which have become important because of the necessity of breaking up many of the old Austrian estates.

Section III is concerned with what we would call civil engineering and architecture. The members are interesting themselves in questions of current importance to the country, such as: the Prague railway stations, the navigability of the water ways, the development of water power, the use of the army in constructing public works, the nation wide development of highways, etc. This section is aiding the Czech Technical University at Brno in carrying on experiments at the University laboratory for locks and weirs. The commission of this section for carrying on research in regard to and for the testing of building materials does its work at the Institute for Research and Testing of Buildings and Engineering Constructions which is attached to the Czech Technical University at Prague which, by the way, is one of the best Technical schools in Europe. This section has also several commissions which are indicated on the diagram.

Section IV, devoted to machinery and electrical engineering has stimulated standardization in the machine tool industry which has been further encouraged by the Czechoslovak Standardization Society. It is also working on the problem of the best method of studying machinery in the engineering schools of the country. It is collaborating with the inter-section commission for such research, and frequently counsels inventors and applicants for patents.

Section V, chemistry and technology, is confronted with problems of sugar manufacture, zymotechnics, ceramics and chemicals. Czechoslovakia is one of the most important beet sugar countries in the world and the problems of the most efficient manufacture of sugar from the sugar beet are of vital interest to the whole

nation. It is also one of the largest producers of beer and hence the necessity of careful consideration of zymotechnics by this section. The work also includes the study of ceramics and has led to the establishment of an inter-section institute for silicate research. A special commission of this institute is studying the question of the fixation of nitrogen from the air.

Section VI occupies itself with economic and social questions. It has established three institutes, one of which, the Psychotechnical Institute, is the oldest institute of the Academy. It began its work along the lines laid out by German scientists, but finding that German methods were limited in their application to persons of German mentality, it has turned its attention to French, British and American methods. It has found much of interest and profit in the work of the Gilbreths and it was through the work of this institute that the connection between the Academy and American engineers was established which has been constantly strengthened and has led to the election of 15 Americans as members of the Academy and the holding of the First International Management Congress. This institute has an especial historical interest attached to it, therefore, in addition to its intrinsic value.

A second institute of this section is devoted to the problems of town-planning. It has arranged many conferences by experts in regard to new building regulations, has given advice to Czechoslovak towns, has provided lectures and published not a little material on the subject. A third institute concerns itself with the economic relations of Czechoslovak emigrants and colonizers and is trying to develop both at home and abroad a more intelligent understanding of world economic problems and of Czechoslovakia's part in them.

Effect of "Waste in Industry" Report

The inter-section institutes and commissions have already been referred to in the discussion of the previous sections. One, in particular, has special interest for Americans, the Institute of Engineering and Industrial Management. The starting point of this institute was the publication of the book: "Waste in Industry," prepared by the Hoover Committee on Waste. This immediately attracted widespread interest in Czechoslovakia and was at once translated into Czech. It was felt that the way to the elimination of waste in industry, agriculture and government lay in developing better methods of management and hence this institute was founded.

In order to arouse further interest and to aid in assembling the most recent ideas in the field of management and in making them available to all, this institute, with the official sanction of the Czechoslovak government, and with the co-operation of other interested societies, arranged the First International Management Congress which was held in Prague in July, 1924. By means of papers prepared in advance and discussions of these papers from the floor the aims of the institute in planning this congress were realized, and the cause of sound management both in Czechoslovakia and abroad was substantially furthered. Americans had an especially important place among the foreigners in the preparation and holding of this congress and hence have a particular interest in this phase of the Academy's work.*

*For further information about this congress, see the published proceedings thereof and "The Prague International Management Congress," by Paul M. Atkins, printed in "The Society of Industrial Engineers Bulletin," September, 1924.

No matter how much research work is done, it has little practical value unless it is made available. The planning of lectures and conferences by various commissions and institutes of the Academy has already been described. In addition to these means of spreading information, the Academy publishes: "the Masaryk Academy of Work Messenger," in which are recorded the reports of the meetings and the work done by the various sections of the Academy. In this journal are also printed reviews of important scientific books and articles and from time to time, articles by some of its members. Moreover, the Academy has published a number of scientific books either as independent volumes or as supplements to the "Messenger."

The Research Library

The Academy is developing one of the most important research libraries in its field in Europe. At present the library numbers some 10,000 volumes and in its reading room are found 91 journals and magazines published in Czechoslovakia and 82 from foreign countries. The use of the library for reference purposes and of the magazine reading room is free to all, but only members may withdraw books for home use.

It is obvious that, to carry on such extensive work, funds are necessary. The first gift to the Academy by the President of the Republic has already been noted. From 1919 to 1923 about 4,000,000 Czechoslovak crowns have been received in the form of subventions by the government and of gifts, including the first gift of 1,000,000 crowns. The government through the Ministry of Schools and National Instruction granted in both 1922 and 1923 the sum of 1,000,000 crowns but in the year 1924 it cut this amount to 700,000 crowns. As the Academy has a budget of about 2,000,000 crowns a year, other support had to be sought and gifts were solicited and have been received both in money and kind. The effort is being made to attract the support of rich and poor alike and to make all Czechoslovaks feel that this Academy is really theirs, founded for their benefit, of practical value to them and that it is their duty as well as their opportunity to give it constant and regular financial support. There is every reason to believe that, as the value of the work of the Academy becomes better known, it will not lack for financial resources, although as the tasks and opportunities before it are so vast there is little likelihood that it will ever be possessed of surplus funds.

The Masaryk Academy of Work is one of the most hopeful factors among many to be found in Czechoslovakia. The problems and dangers before this new-old nation are many and are fully recognized by its leaders, but the genius of the people is great, their capacity for hard work enormous, their poise, balance and moderation is conspicuous and there seems to be very real hope that if undisturbed by war, they will soon work out their salvation. Not only are they capable of helping themselves, but they can render very great services to others. More than any other Slavic peoples they understand and appreciate the concepts and ideas of the Western nations. To them is falling the task of aiding mightily in interpreting America and Western Europe to their Slavic relatives and in making the Slavic nations understood in the West. The International Management Congress has revealed some of these possibilities and the Academy, situated as it is at Prague within easy reach of both groups, possesses the means, not only of solving Czechoslovak problems, but also world problems as well.

AUTOMOTIVE PRODUCTION

The Manufacture of Tapered Roller Bearings

By M. T. Lothrop
Vice-President, Timken Roller Bearing Co.

Two tests for hardness—Inspecting for thirty-nine types of defects—Automatic machines for grinding and gaging—Final finish of rolls by lapping

THE cups and cones are tested for hardness by a file test, as shown in Fig. 16, and a large percentage of rolls are so tested. So far, the file test has been found superior to any other test known. Another test is to bounce each cup off an anvil on the floor. If it bounces the right height it is O.K., if not it goes in the scrap heap.

The casehardening is, of course, done before grinding and to insure a minimum amount of work being done by the wheels, the cups and cones are hardened or quenched over a mandrel, as shown in Fig. 17. The cup is placed above the water on a plug, then a ram comes down inside the cup and the unit goes into the quenching water, the plug and ram maintaining the

Fig. 16—Testing for hardness

internal size of the cup or cone. The allowance for grinding is 0.010 in. and it is desirable that the wheel remove this amount uniformly.

Prior to the hardening operations, the cups and cones are machined from tubing at one operation on the following types of machines: (a) Cleveland single-spindle, (b) Gridley single-spindle, (c) Acme four-spindle, (d) Cone automatic. The Cleveland and Cone machines are used on work from 2 to 7¾ in., the Gridleys from 2¼ to 5 in., and the Acmes from 1⅝ to 3 in. About ⅛ in. is taken out of the bores and about 0.020 in. off the turned tubing. The bores of the cones and the outside diameters of the cups are held to plus or minus 0.003 in. One operator has four machines, grouped two on one side of the aisle and two on the other, as shown in Fig. 19. The operator grinds every tool except the forming tool. Numbers are applied by a stamping operation under small Toledo presses.

One cone, used on Ford front axles, is threaded on Acme threading machines, one woman operating each two-tap machine. A production of 4,000, 18-in. tapped cones about 1½ in. long is reached per operator per day. Lard oil is used as a lubricant. All chips go to centrifugal oil-extractors and then to the briquetters. The cups and cones are now very close to their final size, being if anything somewhat smaller than the finished product to allow for the expansion due to carbonizing. They then go to what is called "green inspection" where they are scrutinized and gaged for 39 types of defects. Failure under some of the defects causes immediate scrappage to the furnaces. Under the others, the part is sent back to the machining department to be salvaged. One man scrutinizes and another man gages. Cup gaging is very simple, the outside diameter and the width being tested in a box fixture having plugs screwed down to the proper limit, with about 0.006 in. variation between the two. The inside diameters of cones are tested by "go" and "no go" plug gages. Two floating

Fig. 17—Hardening cups over a mandrel

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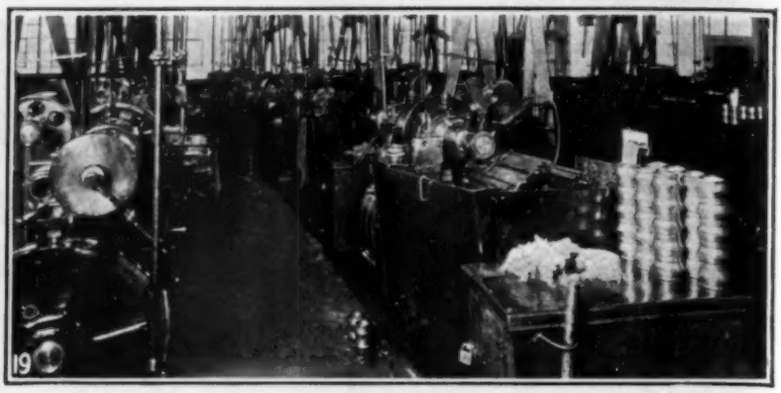
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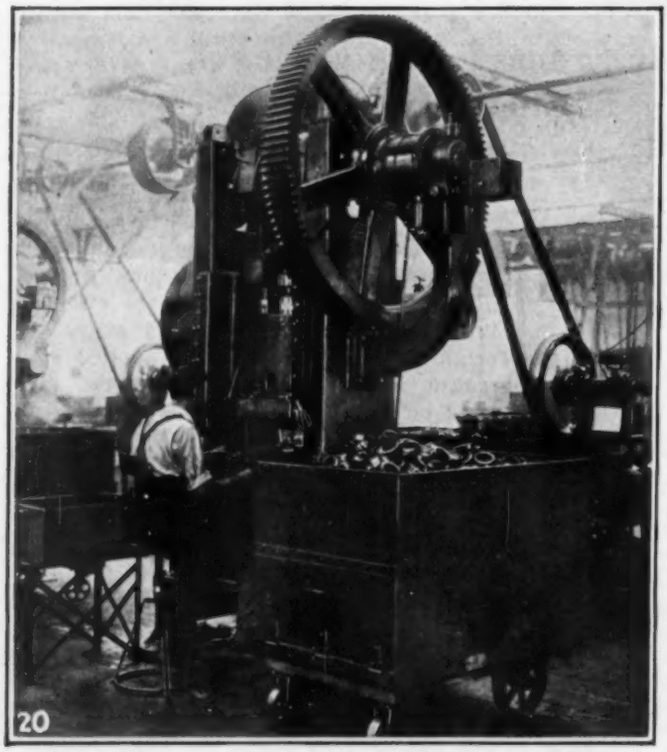
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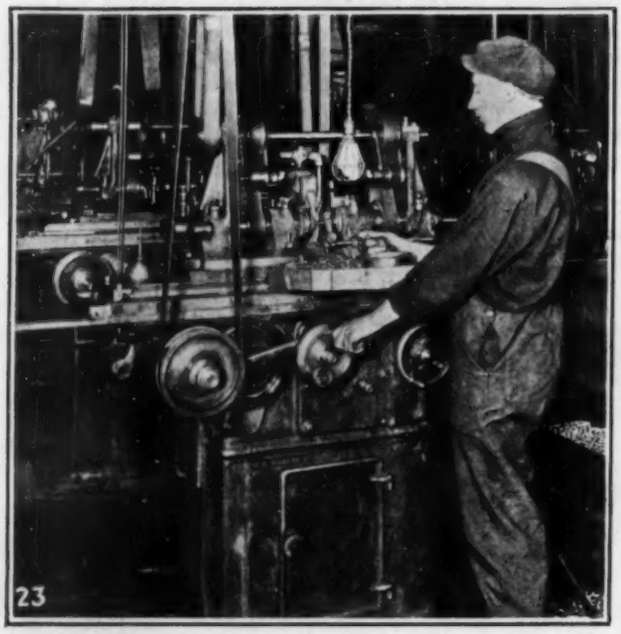
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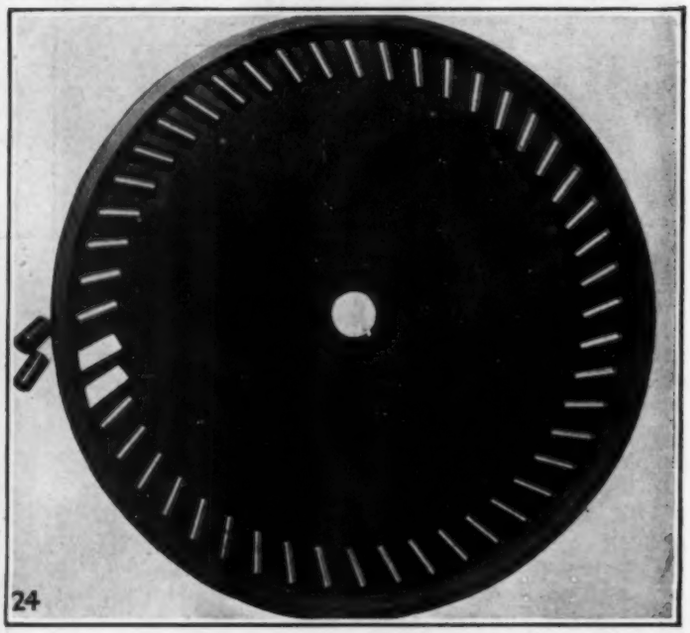
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Fig. 18—Components of a Timken bearing. Fig. 19—Machining cones. Fig. 20—Stamping cages. Fig. 22—Selective gaging for rolls. Fig. 23—Roll grinding. Fig. 24—Spider for roll-lapping machine

AUTOMOTIVE PRODUCTION

inspectors constantly travel among the other inspectors, acting as a "super check" on their work. Accepted cups and cones are hardened by the process already described.

The cages are meanwhile being stamped out in a series of operations, mainly on Bliss presses, Fig. 20. The steel used is a special strip and is the only partly finished material bought by Timken for its product. The first operation forms dished blanks, as shown at *A*, Fig. 21. The second forms the base on the smaller

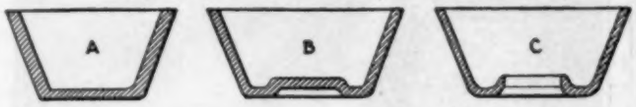


Fig. 21—Progress in stamping cages

diameter, as at *B*. The third cuts the hole in the base, as at *C*. The fourth operation cuts the slots for the rolls, and the fifth forms the wings at the sides of the slots and sizes the complete cage ready for assembly. The slots and wings are so accurate that they can be used as a shadow or light gage for the taper on the rolls.

It will be remembered that the rolls had center countersinks pressed in on the upsetting machine. The countersinks are used during the grinding operation, although experiments are being conducted in the use of centerless grinders. Prior to grinding, the rolls are tumbled in a barrel with hardening-furnace scale as an abrasive. The rolls then pass on to the first size-gaging machine where they tumble from a hopper into a chute, which automatically adjusts them to position by means of a rocker-cam device, their small ends pointing ahead. A circular table contains a series of slots or grooves equally spaced around the circumference and the rolls drop one at a time into the grooves as the table revolves, carrying them under heads that make, or do not make, contact with the roll, according to the size. The largest diameter comes first and the remaining heads are so arranged that each head has an interval 0.00025 in. less than the preceding one. The first contact a roll makes with a head, causes a magnetic device to operate a trap door through which the roll falls into a container, thus automatically selecting the diameter, Fig. 22. The object of this is to give a minimum of removal for the grinding machines.

The grinding machines are mostly special machines with Timken-designed heads resting on Brown & Sharpe bases. See Fig. 23. The wheels are 100-N, Norton alundum, 10 to 14 in. in diameter, and are fed in the full width of the roll with an oscillation of about $\frac{1}{8}$ in. The rolls are placed in a feed chute by hand, the wheel is trued about every 20 min., and one man operates three machines. Rolls are constantly inspected by means of taper-shadow or light gages, for taper and diameter, particularly after each dressing of the wheel.

Another type of specially developed automatic machine, grinds what may be called the back face of the tapered roll. In this machine a magazine attachment places the rolls in a four-station chuck. The first movement is the actual chucking by a tapered wedge-ring device, the second is the grinding operation, the third ejection and the fourth the intake. Rolls are located in this machine from the face to be ground.

The rolls then travel to a washing machine and thence to a group of size-gaging machines exactly similar in principle to the one described above and having 17 stations, each station being 0.00025 in. apart. As before, the rolls drop into labeled containers and then pass to the lapping department, where a number of Bethel-Player machines are in use. About 0.0025 in. is removed from each roll in a two-minute operation. The principle of the machine lies in the sliding or rubbing effect produced by two tables, one running eccentrically on top of the other. The rolls are put in a case-hardened spider, Fig. 24, placed inside a ring on the lower table which is flat. The upper table is convexed or tapered to correspond with the roll taper and is brought down under pressure and revolved rapidly, Fig. 25. The lapping compound used is emery flour and machine oil. The life of the lower table before retruing is necessary, is about 50 hr., while the life of the upper table before retruing is about two to three hours. The life of the spider is two weeks. The tables and the retainer ring are of soft gray iron. The machine stops automatically at the end of the lapping time, and one man operates two machines. The production is 11,000 rolls per day per machine. The rolls are then tumbled in a barrel with the soft-leather scrap of shoe factories. This removes all dirt and oil and leaves the roll clean for inspection, which is done by girls who look for twenty-eight causes of rejection, as per the card shown in Fig. 26. Fourteen of these causes mean absolute rejection to the furnaces, the other fourteen call for salvage. No gaging tools are used in this work, the whole sequence of inspection being visual under a strong light as shown in Fig. 27. Ordinary mazda lamps fitted with reflectors are used to give the light,

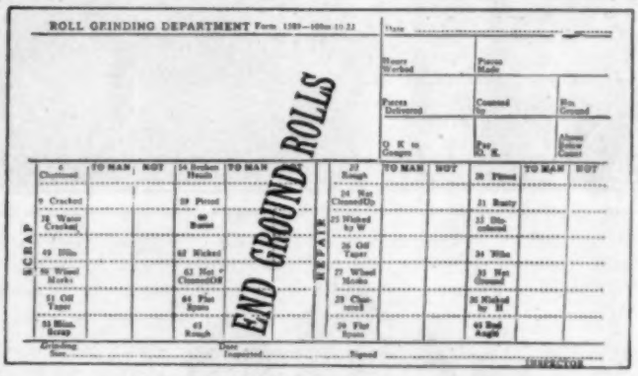
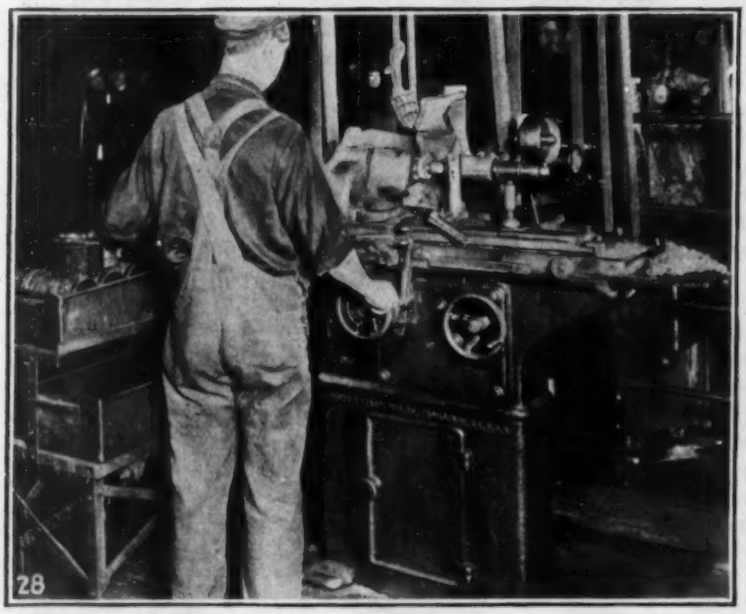


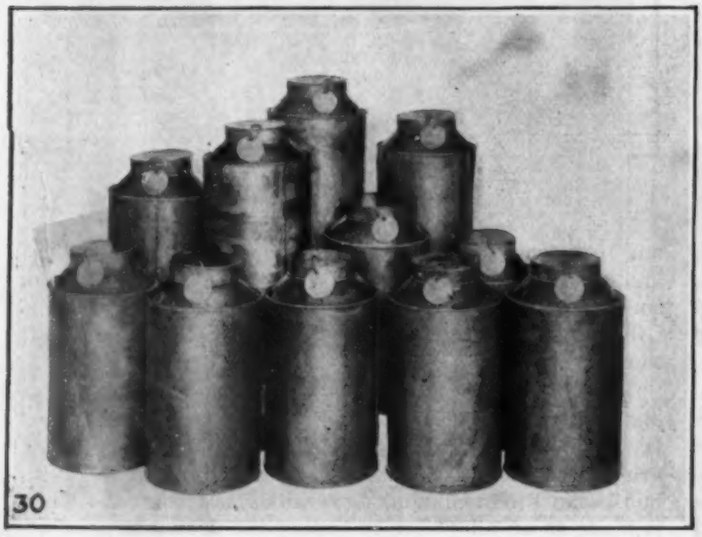
Fig. 26—Roll inspection card

and it is remarkable how rapidly the girls can scrutinize and accept or reject the parts. A girl will scan 7,500 small, 4,000 medium or 2,500 large rolls per day. The Gilbreth type of adjustable chair, is used by most of the girls.

"Super" inspectors constantly check up the work, and in case of new girls, a 100 per cent recheck is given. It may be noted that about 100 rolls out of every 5,000 are expected to be rejected, because of no human fault, but because of accidents beyond human control. This is made as an allowance in basing the premium price of the man who ground the rolls.

The rolls then travel to another group of sizing and





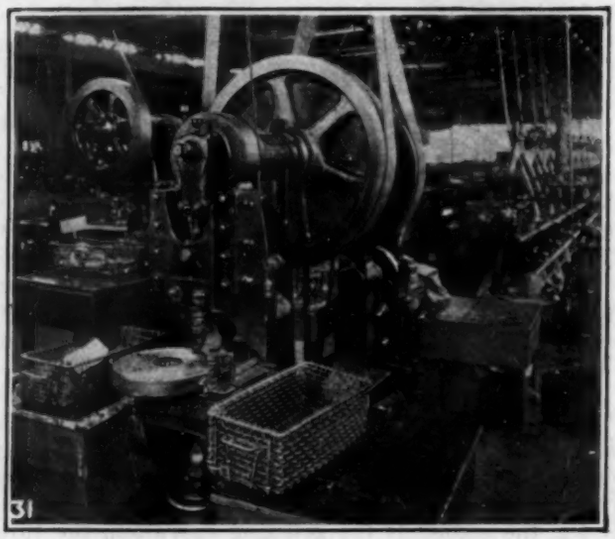


Fig. 25—Lapping machine. Fig. 27—Inspecting rolls. Fig. 28—Grinding inside taper of a cup. Fig. 29—Grinding back faces of cup and cone. Fig. 30—Canisters of rolls. Fig. 31—Assembling press

AUTOMOTIVE PRODUCTION

gaging machines where they are gaged for diameter and accuracy of taper. The containers they fall into, Fig. 30, are sealed with a tab describing their exact size and sent to the assembly bench. Only the foreman of this bench is allowed to break the seal.

Finishing of the cups and cones is done by grinding, as shown in Figs. 28 and 29. Brown and Sharpe, Modern, Norton and Bryant machines are used. Since the taper feature of the bearing allows for a certain limited adjustment, greater than even a large grinding tolerance, there is not so much stress placed on the accuracy of the taper surface as regards diameter. It must however, be held to exceedingly close limits as regards angle of taper and also as regards the quality of the surface. The most important diameter of the cone is the inside and this is ground to a maximum tolerance of 0.001 in. oversize and 0.000 in. undersize. The practice is to use as large a wheel as the hole will take. For example, a 2-in. hole will be ground by a 2-in. wheel dressed off. A 6,660-K Norton alundum wheel is used, though on small work a 6,680-M is used. From 0.007 to 0.010 in. is removed in this operation.

In external grinding, a 100-N Norton wheel about 12 to 16 in. in diameter is used. The diameters of the tapered surfaces are held to 0.004 in. up and 0.006 in. down. The outside diameter of the cup is held to 0.000 in. up and 0.001 in. down. The taper on the cup and cone to a plus or minus, 0.00025 in. variation in diameter large at the small end.

Numerous Gages Used

Gages are profusely scattered among the machines, and the accuracy of the work being produced is checked up at short intervals by floating inspectors.

After grinding, the cups and cones are passed through a Niagara washing machine and are then inspected on twenty-eight counts. As in the case of the rolls, some defects cause scrappage to the furnaces and others call for salvage. Cones are inspected by a gage which registers the tapers and grades the cones into seventeen classifications, so they can be matched up with the rolls. The largest-diameter cone is matched in assembly with the smallest-diameter rolls and vice versa, in the different steps. Constant control exists between this department and the roll department to insure cones and rolls balancing closely in production. All cups and cones are demagnetized after inspection and before assembly.

Only one container of rolls is allowed on the assembly bench at a time—any rolls left over are returned to the sizing-inspection machines. Rolls are put in the cages in simple cup-fixtures and the cone is placed in the center and lightly tapped down. This springs the cage with the rolls against the shoulders of the cone and a final blow from a press, Fig. 31, closes in the cages at the bottom and completes the assembly. The cups are not assembled. The cone assembly is now run in a cup in a species of special drill-press of Timken design under a load of approximately 1,000 lb. at a speed of 240 r.p.m. for ½ min., with a stream of lard oil playing on the bearing. From this point the units go to the final inspection for twenty-two different defects, fourteen of which are cause for scrappage and eight for salvage. It may be noted that even after the very elaborate previous inspection, there are usually 1 to 1½ per cent rejections at this final point. Here as before, "super" inspectors check the work of the other inspectors. Note that there are 600 inspectors in a total force of 3,000. A final test is given for sound in a special machine of Timken design, which tests each bearing by direct comparison with a known sound. Finally the cone units are washed and, with the cups, are passed through a tank of hot petrolatum or vaseline to give protection from rust. They are then wrapped in waxed paper and placed in cartons in the finished stores ready for shipping.

Standardization of Punchings on Auto License Plates

Assistance of the Division of Simplified Practice of the Department of Commerce has been asked, looking to the standardization of punchings for automobile license plates—a present lack which prevents automobile manufacturers from adopting standard mountings, it was announced recently by the Division.

Frequently the mutilation of license plates is made necessary in cases where the punchings on the license plates of the state do not line up with the bracket slots provided by the manufacturer of the car. Even though the laws of some states forbid such mutilation, it is often unavoidable, it is explained.

Such mutilation, it was pointed out, tends to reduce the visibility and legibility of the plate, imposing unnecessary handicaps on state motor vehicle inspectors, traffic officers and other authorities.

These facts are being pointed out in letters to the motor vehicle conferences of the Eastern states and the Middle Western states, as well as to other authorities and to the manufacturers of license plates.

"We believe" says the letter of the Division "that co-operation between state authorities concerned with these license plates, and the automobile builders in the standardization of plate sizes and punchings, also plate mountings and punchings will be of mutual advantage. The plates of any state would thus fit the brackets on any car. Standard locations for the plates to facilitate rapid and accurate identification, also to prevent the obscurity often resulting from present freedom of choice in position on car or truck and uniform requirements for illumination at night, would all be expedited by such co-operation.

"The resultant advantages to state authorities, the car, plate and lamp manufacturers, also the motoring public, are obvious."

The letter to the manufacturers points out that their market would be broadened to include additional states, and would reduce the cost to the manufacturer for dies and other tools to be reckoned with in bids for such work.

It is also indicated to the motor vehicle authorities that such unification would increase the effectiveness of motor vehicle supervision.

The movement has the backing of the Society of Automotive Engineers, whose department of standardization has made some headway toward standard brackets and mountings.

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Do We Want Smooth Cylinder-Walls?

BY J. C. P. BODE

On page 280, Vol. 61, of the *American Machinist* there appeared an article under the title given above, by Henry C. Francis, which I desire to discuss.

It has been found by actual test that a smooth wall gives the best results. Manufacturers of the highest-grade automobiles grind their cylinders to get smoothness of walls and, as Mr. Francis states, often lap them after grinding. They have found by actual test and long experience that smooth walls are best. Manufacturers of high-grade cars would only too gladly eliminate the extra cost of one or two more operations if they thought they could get away with it and if they thought smooth cylinders were not to be desired.

ADVANTAGES OF GRINDING

The fact is that grinding or lapping was resorted to only after finding that bored cylinders were not good enough. It is my personal observation that grinding the bore gives the best results because it produces a smooth wall which is dead square with the flange of the motorblock and that lapping is not necessary after grinding to get a good practical finish.

While a bored block may give good results at the start, these results will not last because the high spots which produce the oil pockets or channels will soon wear down and then we will have to fit new pistons and rings to get compression and prevent gas leaks. A bored job, therefore, in order to give good results lastingly, should be done over every time the walls wear smooth. The walls will not only wear smooth but they will wear oval also, due to the very nature of engine action. If, on the other hand, the walls are smooth to start with, the initial wear will be eliminated which is very important indeed.

A bored job will lose its efficiency after very little running—about 5,000 miles or less—and then the bore will be just about where we would start with an A-1 job as far as smoothness is concerned, only the smoothness will be useless because the fit and roundness of the holes will have been spoiled. We would have to bore again to make the holes round and square with the base and we would have to assemble new pistons and rings once more.

GROUND JOB IMPROVES WITH RUNNING

I dare say that, providing a first class job has been done in either case and providing that no assembly inaccuracies have crept in on the ground job, that after about five hundred miles or so the motor with the ground job will steadily improve as it runs in while the bored motor will be steadily getting worse.

So many points enter into the efficient running of a motor that it is only too easy to blame the smooth cylinder walls, when actually something entirely different is wrong. Smooth walls for smooth running has been my experience every time. Now if rough walls gave best results, how are you going to keep them rough? They will wear smooth anyway so there is another reason to make them smooth to start with and avoid rapid wear to oval-shaped holes, which cause gas leaks, loss of power, carbon, and gas-mixed oil.

Abstracts

from other publications

Aluminum Solder

A solder joint in aluminum is rapidly attacked when exposed to moisture and disintegrated—there is no solder for aluminum of which this is not true. A joint, therefore, should never be made by soldering unless it is to be protected against corrosion by a paint or varnish, or unless it is quite heavy. Solders are best applied without a flux or by using paraffin as a flux after preliminary cleaning and tinning of the surfaces. The composition of the solder may be varied within wide limits, but should consist of a tin base, with zinc and also aluminum. Ranges of compositions are as follows: Zinc, 15 to 50 per cent, tin the remainder; for tin-zinc-aluminum solders, zinc 8 to 15 per cent, aluminum 5 to 12 per cent, tin the remainder. The higher the temperature at which the "tinning" is done the better the adhesion to the tinned layer. By using the higher values of the recommended zinc and aluminum percentages, the repairer will be obliged to use a higher temperature, thus securing a better joint.

There is no reason why a good solder need be brittle. Its tensile strength should be about 7,000 lb. per sq.in. In the actual operation of soldering it is essential that all joints should be kept under slight pressure until the solder is thoroughly set to prevent disruption of the joint. The best method of working is to have an atmospheric blowpipe or blow lamp to play on the work during the process.—*Motor Transport* (England), Sept. 29, p. 397.

Flat Rate Piece Work Cuts Repair Prices

The Eroten-Hudley Motor Co. first of all checked the flat rate system and found that it did not solve all its difficulties, then it used this system as a basis, putting the men on a piece work system using a percentage of the flat rate schedule. One point of interest is that the workmen were heartily in favor of the scheme. If a workman idles on a job it is his own loss rather than the company's; if he takes two hours to do a job that should be one hour, he cuts down his salary 50 per cent. One objection to this system of shop work for repair is that a mechanic is likely to slight his work in his effort to turn out a job quickly. The company got around this by requiring each mechanic to guarantee his work and if a job was done in an unsatisfactory condition, the mechanic who turns it out is required to make it good on his own time.

There is a blackboard in the shop that has on it the names of all the workmen and after each name is a number and a letter. The man's name that is opposite the lowest number on the board is first up for the incoming job. Each mechanic takes his turn for work. The customer is also given a "blackboard number" which is likewise placed on his card and the customer takes his turn. The blackboard also indicates the stage of progress on the job—*Motor Age*, Oct. 2, p. 9.

How to Estimate Machine Shop Costs

By Albert A. Dowd

Time estimates for heavy production milling work—Horizontal boring machine operations—Careful analysis required—Sample estimates for a boring job

WHILE discussing milling problems we have considered only those of comparatively light character. We will now take up heavier work, as done on horizontal and vertical production milling machines, both single- and multiple-spindle. We must realize that there are usually several different ways of milling a given piece and that there are also a number of types of machines used.

In Fig. 48 is shown at *A* a steel casting *B* which is to be surface-milled across the portion *C*, a large spiral mill *D* being used for the purpose. The milling cutter is 3 in. in diameter. Since the cutter has spiral flutes

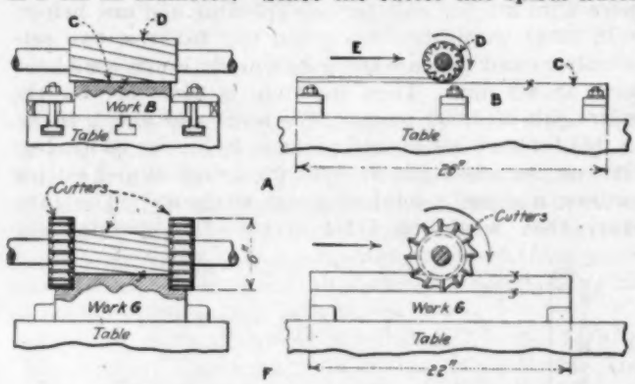


Fig. 48—Examples of plain and straddle milling jobs

and "nicked" teeth to break the chips, heavy feeds can be used if suitable lubricant is provided. The cutter can be run at a speed of 80 r.p.m. with a feed per tooth of 0.005 in. A cutter having 20 teeth would therefore feed 0.100 in. per revolution. As $L = 26 + 1 = 27$ in., then $\frac{27}{0.1 \times 80} = 3.4$ min. approximately. If we add 3 min. for setting and moving, our total time for one piece will be 6.4 minutes.

In the next example *F* we have a steel casting *G* which is to be straddle-milled and faced. The largest cutter diameter is 6 in. which of course regulates the speed. With a 30-tooth cutter and each tooth taking 0.005 in. per revolution, the feed would be 0.15 in. per cutter revolution. Cutters may be run at 60 r.p.m. on this kind of work without difficulty and, as the length of cut is $22 + \frac{6}{3} = 24$, the cutting time is $\frac{24}{0.15 \times 60} = 2.7$ min. approximately. If we allow 3 minutes for setting up, we will have a total of 5.7 min. for machining one piece. Allowance for setting up the machine, grinding cutters, etc., must be made in accordance with the production required.

At *A* in Fig. 49 are shown the cast-iron guides *B* which are to be straddle-faced at *C* and slotted at *D*. The pieces are set up on a simple fixture in two parallel rows with three pieces in a row. The total length of the cut therefore will be 51.7 in., approximately. We shall use a 5-in. cutter having 28 teeth and 3-in. cutters with 20 teeth. With a load per tooth on the large cutter of 0.005 in. we shall have a feed of $28 \times 0.005 = 0.140$ in. per revolution. The tooth load on the smaller cutters would be $\frac{0.14}{20} = 0.007$ in. per tooth, but as the amount of stock removed is not great this load would be permissible. Then if our speed is 50 r.p.m. and figuring as before, we have a cutting time of 7.4 min. To this must be added 8 min. for setting up and removing six pieces, making 2.6 min. for each piece.

In a lot of 1,000 pieces we would need to allow for setting up the machine, incidental and contingent time for grinding and setting cutters, etc.—probably not less than 5 hours in all. Therefore the total time would be $\frac{2.6 \times 1{,}000}{60} + 5 = 48.4$ hrs. for the entire job. This time, of course, allows only for a single roughing cut. If finishing cuts are required extra allowances must be made, depending upon the accuracy needed. Tool and fixture costs would be quoted as a separate item.

An important consideration in milling is the determination of suitable feeds and speed. Using high-speed steel cutters with not a great amount of stock removal, rather slow speeds and coarse feeds are favored for

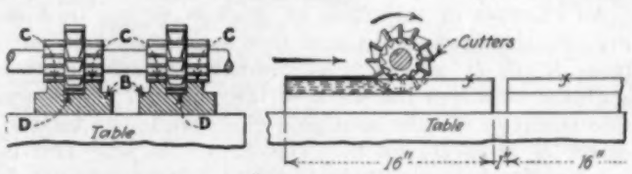


Fig. 49—Production milling job for estimate

roughing cuts. With stellite cutters higher speeds and finer feeds are possible, as the teeth are usually closer together.

In estimating time required for face milling operations the problems presented are slightly different. Fig. 50 shows a good example in the work *A*. The pads *B* are to be rough- and finish-faced with a 12-in. cutter *C* having twenty inserted blades. The speed of the cutter can be at least 20 r.p.m., and even 25 would not be objectionable with a comparatively small amount of stock removal. The feed of the inserted-tooth cut-

This is the sixteenth article of the series. The fifteenth was concluded on Page 777, Vol. 61, No. 20.

ter on open work of this kind can be much greater than in the examples previously given and 0.015 in. per tooth would not be considered excessive. With twenty teeth the feed per cutter revolution would be 0.3 in. If we use 25 r.p.m. for the roughing cut, we shall have a cutting time of about 3 min. As cutter *C* should pass entirely over the work as shown by the dotted

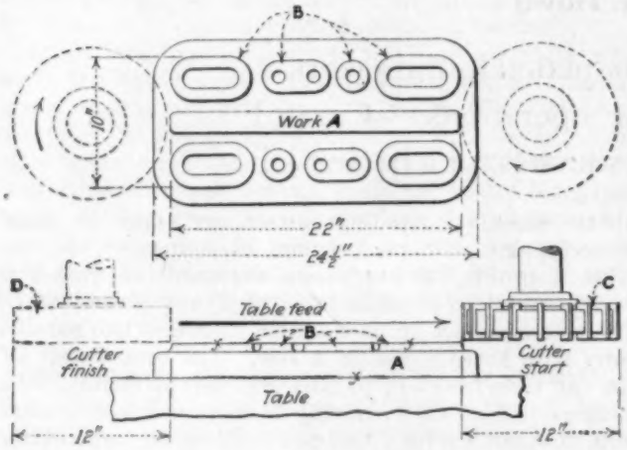


Fig. 50—Production work for vertical milling machine

lines *D*, we must add 12 in. to the feed. This changes the time estimate to 4.6 minutes.

For the finishing cut we can speed up to 32 r.p.m. and use the same feed as in the roughing cut, the time being 3.6 min. We should add about 2 min. for setting up and perhaps 0.5 min. for cutter adjustment on the finishing cut. The total then would be 10.7 min. for both cuts.

Milling machines of the multiple-spindle type are largely used in production work and estimates on work of this kind require considerable care and wide experience. The investment in the machine tool is heavy and the power item a large one, so that as great a production as possible must be obtained in order to make it pay for the setting up. Machines of this character are seldom used except for high production, often running into some thousands of pieces. Naturally the design of fixtures, method of setting up, type of cutter, and feeds and speeds are all of great importance. The greatest care must be taken to make sure that no item is omitted from the analysis.

An example of this class of work is shown at *A* in Fig. 51, the work being cast iron and finished on surfaces *B*, *C*, *D*, and *E*. A clever layout by the tool engineer arranges the work so that cutter *F* mills one side *D*, cutter *G* mills another side *E*, while the vertical cutter *H* mills *B* and *C*. The fixture is long and is arranged to hold sixteen pieces at a time, four in each position. In starting the set-up four rough pieces are placed in position 1. After these have been milled they are transferred to position 2, while four new rough pieces are placed in position 1. This transferring from one position to another is followed out until all four operations on the sides indicated have been done, at which time the fixture will be full. After this the same sequence is followed, setting up in position four new pieces at each pass through the machine and removing from position four completed pieces.

In estimating these operations, assuming that a lot of 5,000 pieces is to be considered, we must be careful to make sufficient allowance for the time required for setting up the machine. We must not forget that the cutters will need grinding from time to time and that this operation necessitates re-setting to maintain the correct sizes on the work. Coarse feeds and moderate speeds are commonly used on work like this, feeds of from 6 to 12 in. per min. being common. The cutters in this case are all 12 in. in diameter and may be run at a speed of 25 r.p.m. With a feed of 0.015 in. per tooth, a 20-tooth cutter would feed 0.3 in. per revolution or 7.5 in. per min. As the total length of the cut is 123 in., the cutting time is 16.4 min. for each four pieces completed.

In connection with the removal of these four pieces, twelve other pieces must be shifted into different positions and four new castings placed in the first position. Some of this work can be done while the work is in process and after it has passed the cutters, but in high-production work it might be found that two machines could be used and that one operator with a helper could handle both machines. The men could distribute their work so that one machine would be operating while the other was being loaded. If we allow 1 min. for replacing each piece we will have none too much time and we can call it 16 min. for setting up and removing. Then 34.4 min. is the total time for completing four pieces or 8.6 min. for each piece. If we use two machines the production would be 4.3 min. for each piece with a labor cost for one operator and one helper.

In other words two machines, two fixtures, two sets of cutters and two workmen will produce one completed piece in 4.3 min. Then the time is 358.4 hr. for the entire job of 5,000 pieces. We must add about 10 hr. to this for each set-up and perhaps 40 hr. for contingent time on the whole job, such as for grinding and setting cutters, making a total of about 60 hours. The summary then would be 418.4 hr. for the operator and

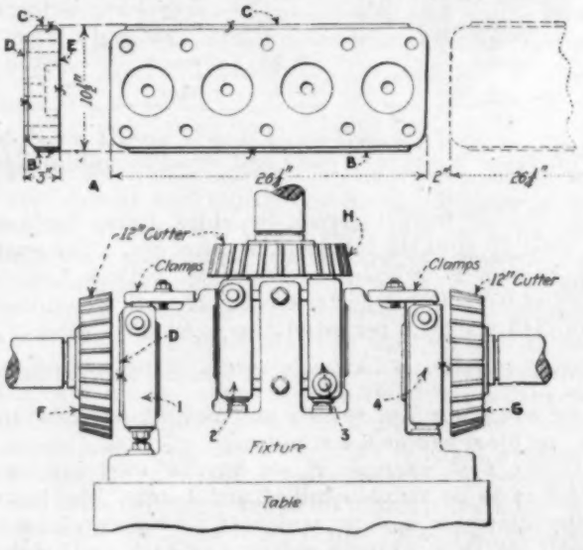


Fig. 51—Example of quantity production work for multiple-spindle milling machine

helper. The tool costs would, of course, be included as a separate item.

In machining transmission cases, gear boxes, machine beds and many other castings of large size having two or more parallel bearing holes the horizontal boring machine is in demand for production work. Several operations are often done in the same setting of the pieces, for example, drilling, boring, reaming, and mill-

ing. Work is set up either with or without fixtures on the table of the machine and various tools are inserted in or fastened to the spindle for the different operations. Even in simple work, there are points of difference in estimating work on a horizontal boring machine from any of those with which we have previously dealt.

Let us make a brief mention of the machine used to avoid any chance of confusion. The spindle is carried in a revolving sleeve, supported on a saddle that

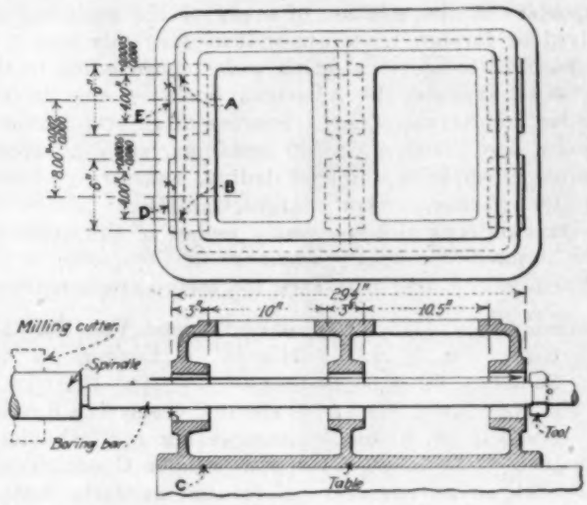


Fig. 52—Horizontal boring machine job for estimate

is adjustable vertically. The platen on which the work is located is mounted on another saddle travelling on ways parallel to the spindle. Feeds are provided for spindle, platen and platen-saddle in all logical directions and there are a great number of possible changes in feeds and speeds. A constant-speed rapid traverse in the reverse direction of all feeding movements is an important time-saving feature.

In making estimates of work done on machines of this type it is necessary to divide the estimate and itemize the time elements according to the kind of work and the machining operations needed. There are four very important points to consider: the nature of the work and the kind of material; the method of setting up the work; the kind of tools used; and the accuracy required.

Let us take as an example the gear case shown in Fig. 52 and note the careful analysis which is necessary, afterward making the time study in the usual way. The work is cast iron and the base *C* has been previously machined. We must bore and ream the holes shown at *A* and *B* and face across the bosses *D* and *E* at one end of the work. We know that the work is cast iron and that the operations on it are boring, reaming and facing. If the work is to be set up on the platen, some arrangement for locating should be made by means of studs, parallels or other means. If it is to be held in a fixture the location will be assured. If the estimate calls for a production of 500 cases, a simple plate with locating studs and clamps will permit rapid and accurate setting.

In regard to the tools used, we would need boring bars with three roughing and three finishing cutters and either a reamer bar for finishing the holes or a flat-blade reamer ground to size. Assuming this to be the case, the same bar would be used for all operations. In addition to the boring bars we would need a milling cutter large enough to cover the pad surface, say 6½ in. in diameter. This cutter would be permanently attached to the spindle sleeve, ready for work when needed. The accuracy of the work is specified by the tolerances given on the drawing. The spacing of the holes from center to center is important, but can be readily obtained by reading the micrometer dials on the machine. We decide that the sequence of operations will be to rough- and finish-bore and ream one hole, then set over the table and repeat the operation on the second hole, finally roughing and finish-facing the bosses with the milling cutter.

In making a list of operations and estimating the time for each one it is safer to list each step in the procedure, as in this way there is less chance for error. Taken up in this way we have the following analysis:

Operation No.	Operation	Time in Min.
1	Set up work on fixture; helper will be required; work located on pins and four clamps tightened.	3.0
2	Put in boring bar and set roughing cutters. Operator sets bar in spindle sleeve, places three cutters in position and sets them. Allow 1 min. for placing bar in position and ½ min. for each cutter	2.5
3	Rough bore diameter 4 in., length 3 in.; feed 0.020 in. per rev.; speed 50 r.p.m. Add 2 min. for approach	3.2
4	Remove cutters. Must knock out locking pins and take out cutters before pulling back bar. Time allowance same as insertion	1.5
5	Return spindle to original position, using rapid traverse	0.2
6	Insert finishing cutters, same allowance as before.	1.5
7	Finish bore; same feed as for roughing; speed increased to 80 r.p.m.	1.9
8	Remove finishing cutters	1.5
9	Return spindle	0.2
10	Put in single reamer cutters	0.5
11	Three holes in succession. Use same speed and feed as in finish-borning, then 9 ÷ 1.6 = 5.7 min., to which add for hand movements between cuts, 0.5 min. Total for this operation	6.2
12	Remove reamer cutter	0.5
13	Return spindle	0.2
14	Set over table for second hole	1.0
15	Repeat operations 2 to 13 inclusive	19.9
16	Remove boring bar	1.0
17	Bring up table for rough milling position and adjust	2.0
18	Rough-mill face of pad, using 6 in. cutters with 20 teeth. Length of cut 14 + 6 = 20 in. Speed of cutter for roughing 40 r.p.m. Feed per tooth of cutter 0.004 in. or 0.08 in. per cutter revolution	6.3
19	Rapid-traverse return table	0.2
20	Set table for finishing cut	0.5
21	Finish-mill face of pad; same as roughing cut except speed increased to 60 r.p.m.	4.2
22	Bring table to original position for boring	1.0
23	Remove work from table	1.5
Total time for one piece, floor to floor		60.5

By this careful figuring of each movement required for the work, we do not need to make any additional allowances to cover contingencies except those required for replacements and grinding of tools. In making the summary for this piece we would need to make allowances for contingent time in setting up the machine and for little troubles here and there, say a few hours on a long job like this. An addition of 10 hours would not be considered excessive.

The writer well remembers an estimate which was required on the job shown in Fig. 53, in which an appalling array of tools was required, so many in fact, that a specially numbered rack was provided for them and the operations were carefully specified by number

so that the operator's work was laid out for him in logical form and much simplified. The work had been done for a period of three years in lots of 25 pieces and the time for completion of one piece with a skilled workman and a helper part of the time was about 18 hours. After an estimate and a time study had been made the work was done by a comparatively unskilled

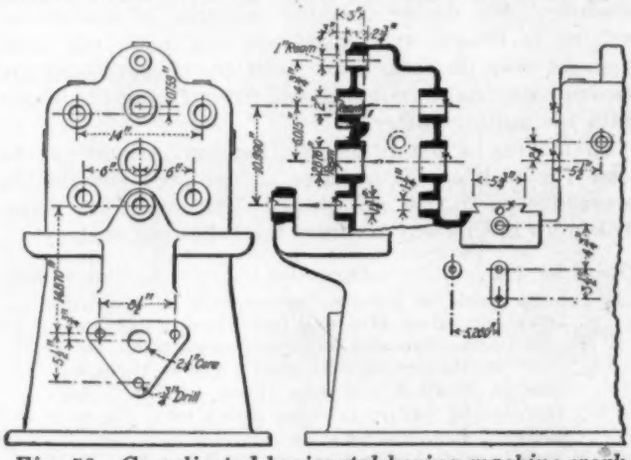


Fig. 53—Complicated horizontal boring machine work

man in lots of 25 at an average time of 6 hours per piece. The casting itself weighed about 90 lb. and the jig in which it was located was almost as heavy as the casting.

Many shop men express doubt as to the value of an estimate made in great detail but the results obtained prove conclusively the value of conscientious work along these lines.

Book Reviews

Automotive Construction and Operation. By. J. C. Wright and Fred C. Smith. Four hundred and twenty-six pages, 6x9 in., cloth, illustrated. Published by John Wiley & Sons, Inc., New York City. Price $3.

A book written for the man who has to do with upkeep, repair and operation of a completed automobile, rather than for the designer or production man. It deals with the principles of motors, carburetors, lubrication, cooling, ignition and other subjects, showing applications to well-known makes of cars. A chapter on driving is included. The book is well adapted to the purposes for which it was written.

Year Book of the Merchants' Association of New York, 1924. 380 pages, 6¾x10 inches. Published by the Merchants' Association of New York.

The Record of the Merchants' Association for the year ending May 1, 1924, as set forth in the Year Book, is now ready for distribution. The Association had 7,093 members on August 9, when the membership lists which the book contains were finally revised. The lists occupy 253 pages and contain both alphabetical and classified arrangement of the members. The alphabetical list gives the name of the member, the address, the personal representatives of firm or corporation members, the business, and also indicates the division and subdivision under which the name is recorded in the classified enrollment. The Association's membership is complex, consisting of individuals, firms and corporations connected with every trade, industry and profession doing business in and from the city. The membership also includes a number of prominent concerns identified with New York's trade located within the Metropolitan District. As heretofore, firms and corporations preponderate in the membership.

Foreign Commerce Handbook. Thirty-nine 6x9-in. pages. Published by the Foreign Commerce Department of the United States Chamber of Commerce, Washington, D. C.

Sources of information of value to exporters and importers in the solution of many of the problems involved in foreign trade are indicated in this book. It is designed to contribute to a wider appreciation of the facilities available to American business men in the conduct of overseas trade. Sources of information and service are listed under 90 headings, such as acceptances, advertising, bills of lading, chartering, incorporation abroad, harbor charges, samples.

The handbook also contains a review of the constructive action taken by the Chamber of Commerce of the United States with reference to foreign trade matters.

Transactions of the Newcomen Society, Vol. III. 140 pages 7¼x10 in. Published in London by the Socicty. Price 20 shillings.

The Newcomen Society is about the only one devoted to a study of the history of engineering and technology. The present volume deals with Simon Goodrich and his work as an engineer; Notes on the early history of steel making in England; Sir Henry Sidney's steel works; Notes on old windmills; Indian cotton prints of the 17th and 18th centuries; Early history of the coal gas process; Savery, Newcomen and early history of the steam engine and notes on Sir George Cayley as a pioneer of aëronautics. Cayley's work was with lighter than air devices that were designed early in the 19th century. In present-day terms they were dirigibles, some with gas and some with hot air, while in one at least, these were combined. Those historically inclined will be much interested in this volume.

Weights of Castings Shown on Drawings

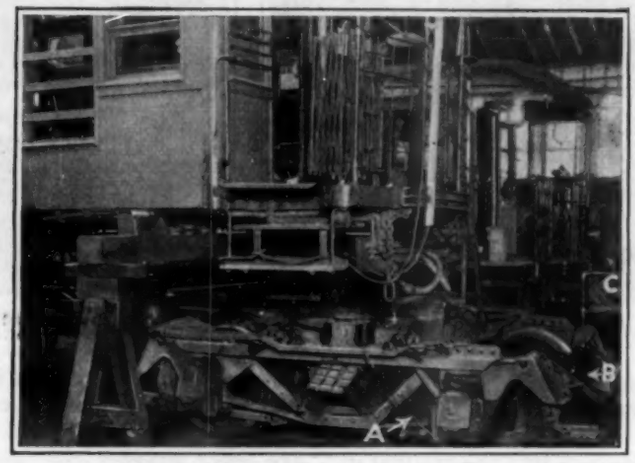
Designers and consumers of castings render a service to themselves and to foundrymen, when they show on their drawings, the weights of castings they intend to purchase. This statement is made in *Research Group News*, which goes on to say: The weight of a casting must always be obtained in order that the foundry can calculate the cost of making it. When the casting has been made on a previous order, its actual weight can readily be obtained; but when this is not the case, the weight must be calculated from the drawing of the casting in order that the foundry may estimate the cost of making it, and thereby establish an equitable price for the casting based on its production cost.

The usual practice, when a casting is designed, is for the engineer or draftsman to estimate its weight, especially in those instances where it is desired to secure the minimum weight with the maximum strength, as is generally the case in buying electric-steel castings. It would be very desirable if the designing engineers would make permanent records of their estimated weights, by showing them on the drawings of the castings, thereby eliminating the duplication of effort on the part of the foundries, when each one receiving the inquiry is compelled to calculate the weights, with loss of time to all concerned.

Repairing Motor Trucks for Subway and Elevated Railways

By Fred H. Colvin
Editor, *American Machinist*

Running trucks under raised cars by their own power saves much time and much labor



Special clamps for lifting trucks by wheels do not disturb packing of the journals

Fig. 1—Moving truck from under cars

WHEN the motor trucks of the New York Rapid Transit Corp. require overhauling for either mechanical or electrical troubles, the cars go to the repair shop at 39th St. and 3rd Ave., Brooklyn. This was formerly the terminal of the old Sea Beach steam railway, some of the stained glass windows which formerly adorned the waiting room and gladdened the eyes of Coney Island travelers, being still in evidence. Needless to say the building is entirely inadequate and ill-adapted for the present work. In spite of this, however, the shop handles about 80 cars a month, these being from both the subway and elevated lines. Part of the shop was formerly a row of apartment houses of which the fronts remain but whose interiors have been altered to suit different kinds of work as well as possible. The result, however, is neces-

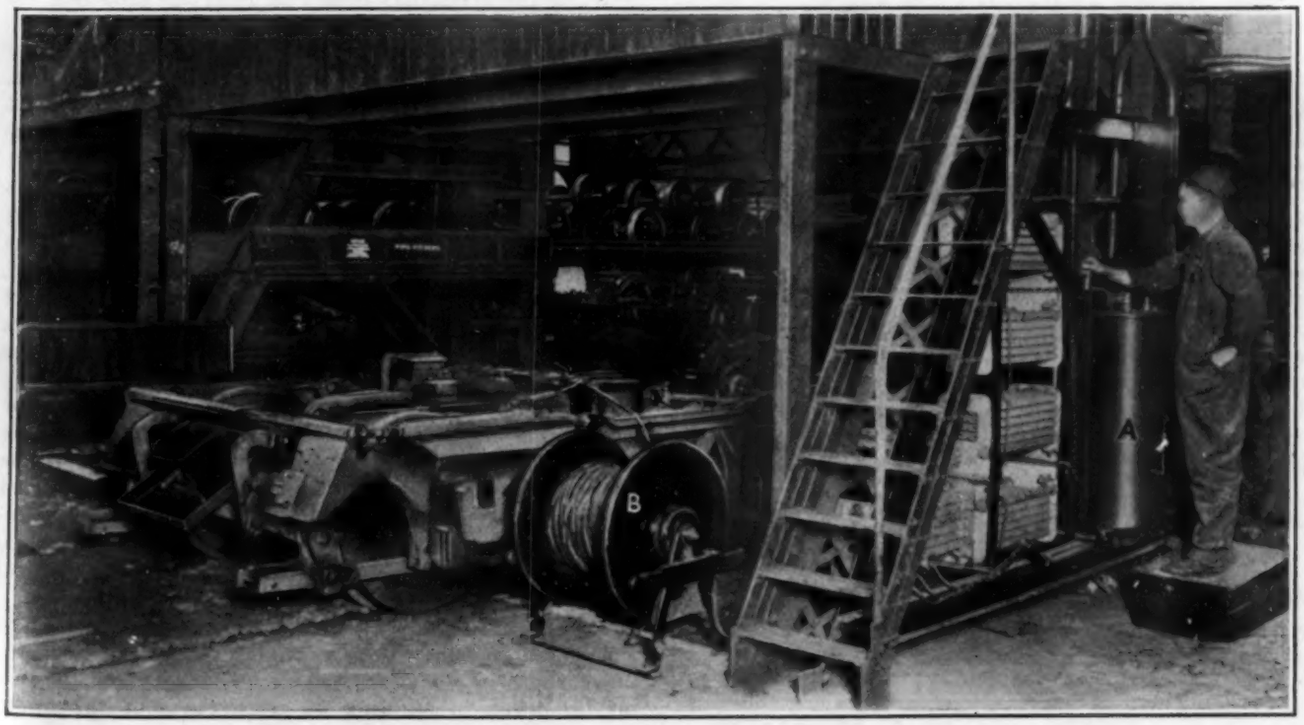


Fig. 2—Controller and cable for trucks

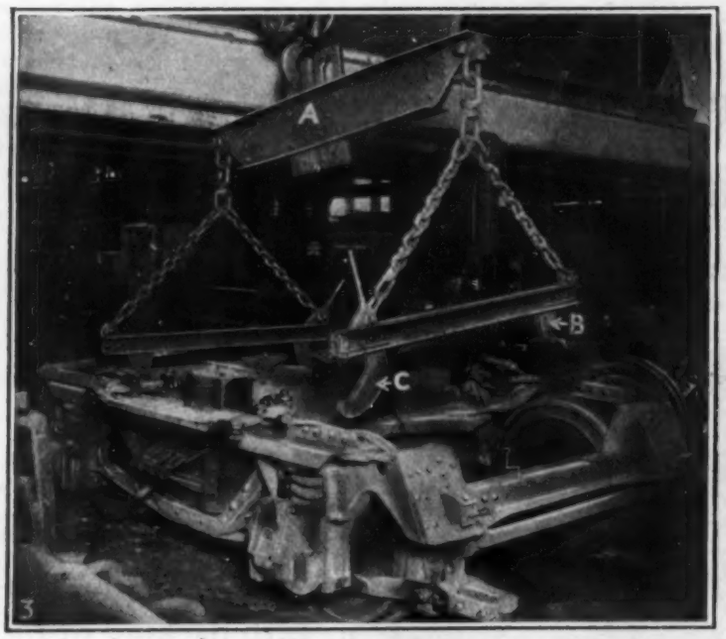


Fig. 3—Clamps that lift by the wheels.

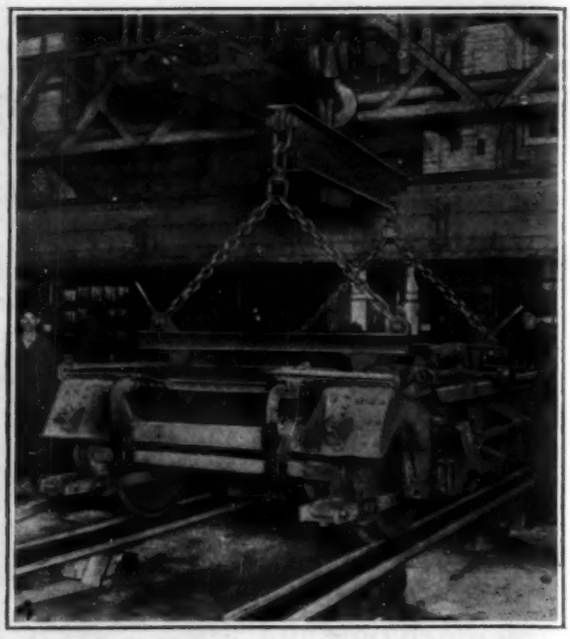


Fig. 4—Truck just lowered on work track

sarily a series of small rooms which does not make for either convenience or economy. But new shops are in the air and will, it is hoped, materialize before long.

The cars to be overhauled are run into the train shed, the first car coming nearly to the repair shop itself. They are then jacked up, as in Fig. 1, and supported by their sills on cross beams resting on the three-legged horses shown, being raised high enough to permit the trucks to be run out under the cross beams. The interesting feature of this operation is that the trucks are run out under their own power by using a long insulated cable, shown at *A*, and a portable switch, as at *B*. This method permits trucks to be easily run out or in, under a long string of cars, due care being exercised to prevent accidents. Men with signal flags show the operator just how to handle the controller at all times. The danger signal shown at *C* blocks the aisle when trucks are being moved.

The controller and operator are shown at *A*, Fig. 2, as well as the coil of insulated cable. The cable is carried on the portable reel *B* which can be carried by two men to any desired point so that the one controller can handle trucks on any track in the train shed.

The controller is located on the steel frame work which supports one end of the crane structure in the shop bay across the end of the train shed, and also the foreman's office above. The wheel storage can be seen in the distance but will be shown in more detail later.

When the truck has been run into the shop bay the larger, 15-ton crane brings the lifting clamp into position over the truck as in Fig. 3. It is an interesting clamp in several ways. The cross beam has two eyes, at *A*, so spaced as to lift over the center of gravity of the different styles of trucks in use. In this way trucks are held fairly level while being moved.

Another interesting feature is the method of clamping so as to lift by the wheels rather than by the truck frame. The fixed jaw, *B*, Fig. 3, goes under the rim of the wheel at the right while the movable jaw, *C*, hooks under the rim of the other wheel. The lift of the crane tightens the jaws into the wheels and holds the truck firmly while being lifted and carried to the work track shown in Fig. 4.

The advantage of lifting by the wheels instead of by the frame is that this method does not disturb the relation of the boxes or the journals. When the frame is lifted the axles drop down in the pedestal jaws and the waste in the boxes is disturbed and has to be repacked. When the axle has to be removed anyhow, this, of course, is of no consequence, but in many cases lifting by the wheels saves considerable time and money.

By elevating the work tracks, Fig. 4, it is much more convenient for men to work under the trucks, and pits have not been found necessary. Evidences of the use of the torch in building up worn parts of the brake rigging, can be seen at various points.

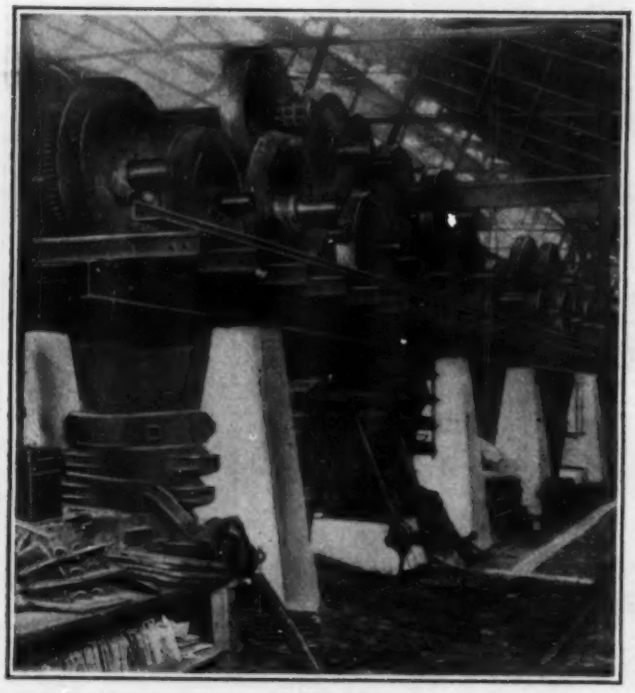


Fig. 5—Storage rack for wheels and parts

The construction of the wheel storage track, shown in the distance in Fig. 2, can be seen in detail in Fig. 5. The concrete columns support I-beams which in turn carry short sections of rails riveted to them. These rails are so spaced as to hold the wheels far enough each side of the center to effectively prevent their being easily moved, as safety is the chief consideration and no chances are taken. A heavy angle bar is also fastened to the ends of the cross rails to prevent the possibility of the wheels being moved sideways into the aisle.

By having this storage track elevated on the columns considerable storage space is made available underneath, this being used for replacement parts needed on the trucks being repaired.

If, in addition to motor or other repairs, it is found that tires need to be turned, the axles are removed and sent over to the 36th St. shop, whose wheel-turning equipment has already been shown. When the wheels are returned they are stored on the rack, Fig. 5. The wheels are lapped by each other to increase the room. They are also piled up on each other in various ways. The liberal use of whitewash on the concrete columns helps greatly in lighting up the storage space beneath the tracks and also tends to prevent accidents. The white aisle-line is seen in the same view.

The employment of air-slaked lime on the floor beneath the work tracks, Fig. 4, is somewhat of an innovation. It lightens up the under part of the truck and makes it much easier to find any parts that drop on the floor from time to time. The lime also acts as a disinfectant and is considered desirable from a sanitary standpoint.

The Extrusion of Brass Rod by the Inverted Process

By R. Genders

THE work already published by the author on the subject of extrusion has dealt with the character of the defect that appears as a concentric core in the rod (termed the "extrusion defect"), and its relation to the peculiar nature of the flow taking place in the container of the press under the usual conditions, in which the pressure is applied at the end opposite to the die. The defect is ascribed to the turning inwards of the skin of the billet at the edge of the plunger, the surface of separation due to foreign matter in the billet skin following a characteristic path and reaching the die before the billet is completely extruded.

Despite evidence to the contrary, the opinion still seems to be held by some that defects in extruded rod are solely ingot defects, and therefore of the same character as those in rolled rod. No evidence has been presented, however, to support this opinion against the fact that the characteristic mode of flow which gives rise to the defect is found to be unaffected whether the piped end of the billet is placed at the die or the plunger end of the receiver.

The method now commonly, but not universally, used by manufacturers is the extrusion of sound rod only, leaving a billet residue of 15 to 20 per cent for remelting. Precautions against entry of the billet skin are also taken by the use of billets which closely fit the receiver and a plunger that can be centered so as to leave a uniform shell.

These measures appear to be the most effective that can be applied to existing presses, and must decrease very considerably the possibility of producing defective rod. Since, however, the mode of flow remains unaltered, any relaxation of the precautions or the presence of deep surface defects in the billet must inevitably lead to the production of the coring defect, while the avoidance of the defect involves a large percentage of scrap.

The method of overcoming the formation of the defect favored by the author consisted in completely altering the direction of flow in the receiver by inverting the process, so that the die was pressed into the billet, the rod being extruded through a hollow plunger.

The present paper deals with a number of experiments carried out on a manufacturing scale with a press designed to extrude by the new method.

The design and construction of the press were undertaken by Messrs. Henry Berry & Co. of Leeds, England, who first made as detailed a survey as possible of the extrusion methods in use in this country satisfying themselves that a large proportion of discard was inevitable in the ordinary process, and that the pioneer task of making the first inverted horizontal press was likely to be justified by the possibilities of the new method.

The press specified was 900 tons power at 1½ tons per sq.in. hydraulic pressure, suitable for the extrusion of lead-free brass and other alloys to rod of diameters up to 2¼ in. The bore of the receiver was 6¾ in. in diameter and 27 in. in length, allowing the use of a billet 6⅝ in. in diameter and 24 in. in length. In view of the experimental nature of the press, a working test was imposed requiring the successful extrusion of five billets of 60:40 lead-free brass to 1-in. diameter rod.

The press consisted of two main cross-heads, one carrying the hydraulic cylinder and charging arrangement and the other holding the hollow plunger. The two cross-heads were connected by steel columns. These carried the container, which was movable either by means of the main ram or by two small auxiliary stripping rams. The charging arrangement consisted of a laterally movable solid block, having attached to one side a cradle for the billet. On centering the cradle with the container a small hand-operated pusher in the hydraulic ram can be used rapidly to charge the billet, and by moving the carriage across the press the solid block, or "gag," is interposed between the receiver and the hydraulic ram. The receiver was of the usual jacketed type, and was heated by gas-burners.

The maximum hydraulic pressure available was 1,850 lb., which, allowing for the same pressure on the billet as in the ordinary method, necessitated the reduction of the bore of the receiver to 4¾ in. for the purpose of the tests. The hollow plunger was 4⅜ in. in diameter, with a bore of 1½-in. diameter.

The sequence of operations is as follows: The billet to be extruded is placed on the ramp attached to the gag, which allows it to fall into the cradle cast on the side of the gag; the gag is then moved across the table to the stop, which brings the billet central with the container. The internal pusher is actuated by a hand-wheel rack and pinion and pushes the billet into the container.

The pusher is brought back, and the gag moved back

Abstract of a paper presented at a meeting of the Institute of Metals held September, 1924, London, England.

against the end stop to close the container. The small rams are moved forward to seal the container against the gag. Pressure is now applied to the main ram, which moves forward, carrying the container and extruding the metal through the stationary plunger. When this is completed the main cylinder is exhausted and the stripping rams pull the container forward to eject the discard at the back.

In all 24 billets were extruded, comprising 19 of lead-free 60 : 40 brass (4¾-in. diam. x 24 in.), 2 of 57 copper, 41 zinc, 2 per cent lead alloy, of the same dimensions, and 3 of 57 : 40.5 : 2.5 alloy (4 7/16-in. diam. x 23 in.). The latter 3 billets had not been cropped, and each contained a pipe 1½ in. in depth, but the remainder were ingots from which all trace of visible piping had been removed. The surfaces of the lead-free brass were good, but those of the lead-brass were defective, some having a potential "skin" of not less than ½ in. in some places. The billets were heated in a gas-fired oven furnace, two at a time, and soaked for about 15 minutes at temperatures varying from 780 deg. to 830 deg. C. The time taken to charge—i.e., from the opening of the furnace to the commencement of movement of the hydraulic ram—occupied from 20 to 50 seconds. It is estimated, however, that in routine working, with the furnace at a suitable elevation, charging could be regularly completed in 10 seconds. The temperature of the container was 150-200 deg. C. A uniform central aperture in the die of 1-in. diameter was used throughout. Speeds of extrusion from 0.27-in. to 2.1-in. movement of the hydraulic ram per second were employed. The die was not attached to the hollow plunger, being inserted in the container from the opposite end and pushed into contact by a bar. The whole of the operation of the process was carried out by workmen, none of whom had previously seen the extrusion of metal.

Effect of Oxidized Billet Skin

The first step was the extrusion of as much of the billet as possible, with the object of ascertaining the mode of flow and the degree to which the rear portion of the rod was affected by the oxidized billet skin, which in the small-scale experimental work collected on the die until all but about 5 per cent of the rod had been extruded. A die which closely fitted the container was used, so as to leave a minimum thickness of "shell." The inner face of the die was flat, with a sharp edge to the aperture and the periphery. Extruding 60 : 40 lead-free brass in this way, it was found that the billet could be reduced to a length of under 1 in., the pressure necessary only reaching the maximum at about 1½ in. from the end of the pressing in some cases, while in others the maximum was not required. The average pressure per square inch on the billet throughout the major portion of the stroke was about 16 to 21 tons. The surface of the rod was good over the forward third of the length, but after that it was poor, the under side, coming from the lower part of the billet, showing longitudinal tears and small patches of oxide and dirt embedded in the metal.

Fractures taken at different positions along the rod were sound and showed no indication of the core defect. The extrusion of billets with a thick defective skin produced correspondingly worse surface defects, while billets from which the outer surface had been machined gave only a small number of slight defects. It was evident that the billet skin was not collecting on the die face to the large extent which had been anticipated. Small modifications, such as the machining of a step on the inner face of the die, did not appear to affect the flow to any appreciable extent. A very thin shell, sometimes completely cylindrical, was generally left in the container, its weight averaging under 1 lb. This gave considerable difficulty, since it was too thin to be ejected with the die and billet residue, and was too tough to be broken away easily by prising from the container walls.

Improvement in all directions was obtained by reducing the overall diameter of the die. With a clearance of just under ⅛ in., a shell was left which was cleanly ejected with the billet residue. In many cases the die centered itself sufficiently to give a complete cylinder, and the surface of the rod was uniformly good. When portions of the shell were missing, defects were produced in the corresponding portion of the rod. The further step of centering the die on the end of the plunger removed this difficulty and the resulting rod was uniformly good. The clearance given by the die of 4¾-in. diameter was somewhat too large, the shell being extruded round the edges sufficiently to lengthen it considerably and so increase the wastage to from 8 to 15 per cent. A total discard of 10-12 per cent would appear a reasonable figure for practical working on the lines indicated.

Pressure Necessary for Extrusion

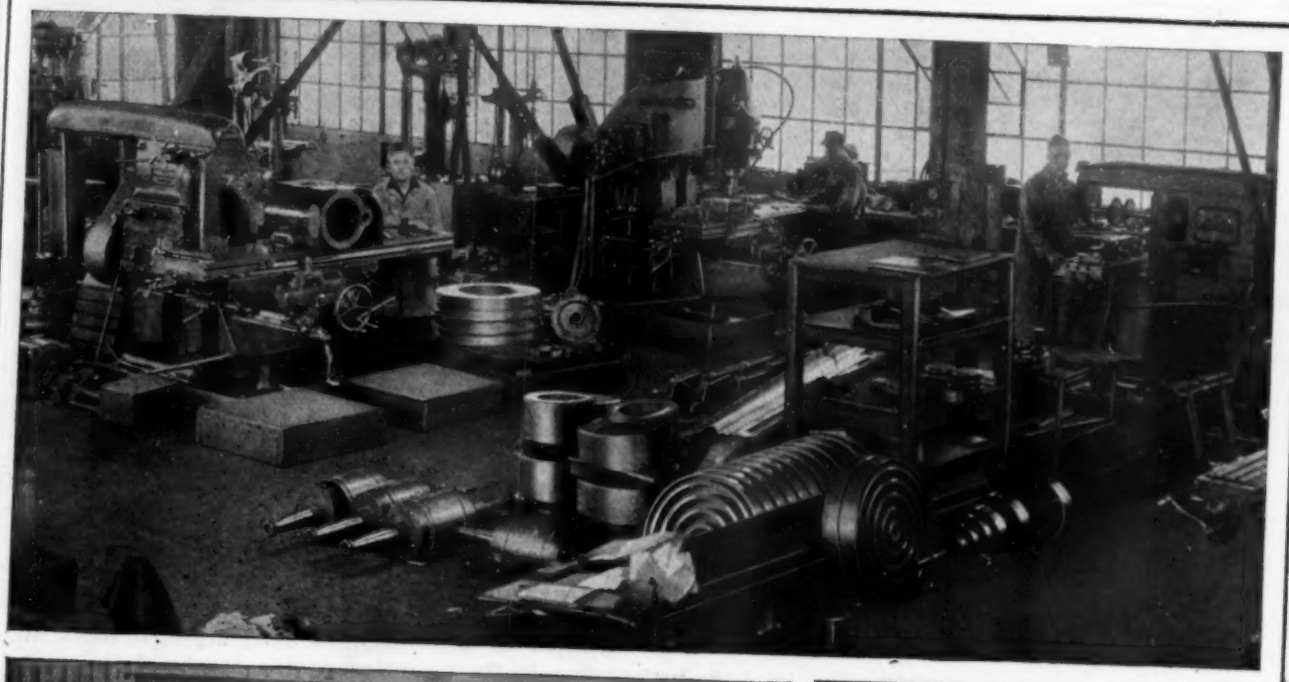
The brass containing lead, which is probably the material most generally used in the extrusion process, proved much easier to extrude than the lead-free brass. The maximum power of the press was never required with this material, even when extruding down to a residue of ⅜-in. thickness. The average pressure used was 15 to 17 tons per sq.in. on the billet, representing a considerable economy in power over the ordinary method, in which a pressure of 25-28 tons is understood to be required under similar conditions.

The experiments carried out on a manufacturing scale, although not extensive enough to constitute a complete study of the method, have provided ample data to show that the inverted process is incapable of producing internally defective rod when sound billets are used.

Precautions are necessary to secure good surface, the method adopted for the present being the avoidance of entrance of the skin of the billet into the region of flow. The consequent increase in the proportion of discard, although rendering the ejection of the billet shell more simple, brings the total discard above the ideal minimum of about 5 per cent, which might otherwise have been possible. Even so, however, the proportion is less than in the ordinary method.

The observations of the relative pressures required by the two processes operated on a small scale are fully confirmed by the large-scale practice. For the same types of material, the pressure required by the new process is about 25 to 35 per cent lower than for the ordinary process. This advantage must also be reflected in decreased wear and tear of the plant.

The structure of the extruded rod does not show the concentric zones of material, varying in crystal size and physical properties, often produced by the peculiar nature of the flow which obtains in the ordinary process. The rear portion of the rod is variable in structure and hardness from center to outside, but in a continuous gradient.

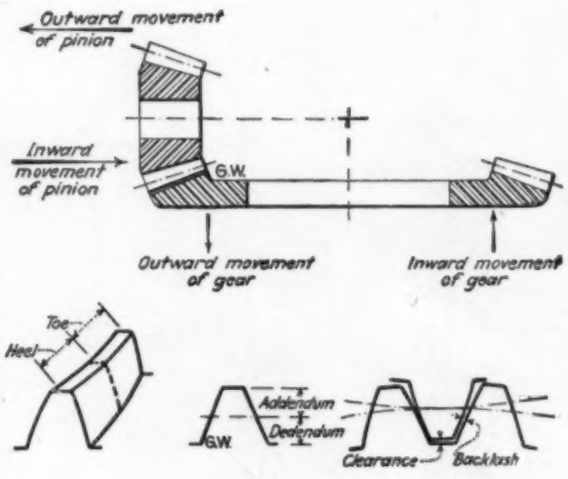


Where Machine Tools Are Made

The Blanchard Machine Company

Cambridge, Mass.

Established 1899



Testing and Adjusting Spiral Bevel Gear Drives for Automobiles

By permission The Gleason Works, Rochester, N. Y.

THE proper adjustment of bevel gears in assembly is a vital factor in obtaining quiet and durable gears.

There are two distinct considerations in obtaining the proper tooth contact; one is the bearing along the tooth, lengthwise bearing, the other the bearing up and down the tooth or profile bearing, and it is essential that the two be considered separately to obtain the proper results in combination.

At the top of this page will be found graphic definitions of the terms used in describing the proper procedure to mount a pair of bevel gears.

Bevel gears are cut with a predetermined amount of backlash to suit the pitch and operating conditions and this backlash should not be altered by any great amount to obtain the proper tooth contact, as the necessity of such a step indicates a fault either in the cutting or in the alignment of the supporting bearings. The usual amount of backlash is from 0.004 in. on 8 pitch gears to 0.012 in. on 3 pitch.

Bevel gears mounted in a rigid testing machine, should show a bearing toward the small end of the tooth and the amount the bearing favors the small end is determined experimentally by the stiffness of the mounting in which the gears are to be finally assembled. Any spring in the mounting of the gears under load will cause the bearing to move toward the large end and in no case should the bearing be heaviest at the large end of the tooth under the operating load. Any extra load, such as induced by suddenly applying the full load, will cause the bearing to become concentrated on the top corner of the large end of the tooth and breakage will ensue.

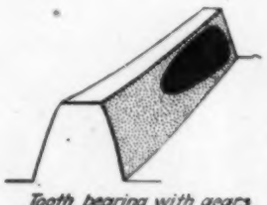
In the figures below we have shown typical tooth bearings as obtained in a testing machine and when mounted in an automobile axle, also the effect of spring in the mounting on the apexes of the gear and pinion. It will be observed that the apexes do not coincide when the gear mounting has sprung under the working load. Therefore, when cutting the gears, it is necessary to make provision for this lift or spring.

Bevel gears are commonly cut to run flush at the large end of the teeth and as a first step, they should be so assembled in the mounting for an initial trial. Powdered red lead and any light machine oil should be mixed and spread over the working surfaces of the teeth with a brush to show clearly the tooth contact obtained.

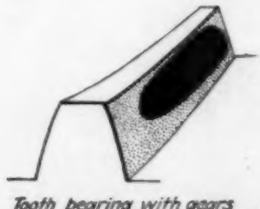
There is no difference in the method of adjusting spiral or straight bevels, and while the following statements are particularly applicable for spiral bevels, they are also true for straight bevels.

After mounting the gears flush with the proper amount of backlash, they should be operated under load in each direction for a minute. In the case of the automobile rear axle driving gears, the rear axle should first be raised to have the wheels clear the floor, then start the motor and drive the wheels in both directions with the brakes applied to obtain the necessary load.

All figures show the bearing on the gear tooth. With a right hand spiral bevel gear, (mating with a left hand spiral pinion) mounted in an automobile, the driving side is on the convex side of the tooth and the concave side of the tooth is used when in reverse.



Tooth bearing with gears mounted in testing machine



Tooth bearing with gears mounted in non-rigid mounting

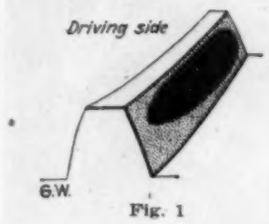


Fig. 1

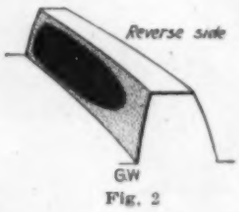


Fig. 2

The tooth bearing, both lengthwise and profile, should appear as shown in Figures 1 and 2, but a condition of tooth contact may be obtained as indicated in Figures 3 to 14. The lengthwise bearing adjustments will first be considered.

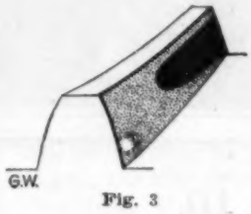


Fig. 3

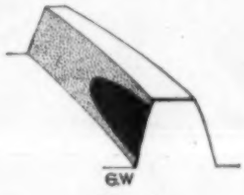


Fig. 4

Figures 3 and 4 show what is called a cross bearing and is caused by either a misalignment of the mounting or an error in the cutting. The mounting should be tested and if found faulty, should be corrected. If the drive side has a toe bearing and the reverse a heel bearing, the gears are serviceable provided the bearing is about $\frac{2}{3}$ of the tooth length, but if the heel bearing occurs on the drive side, it should not be used and the cutting conditions should be altered if the mounting is found correct.

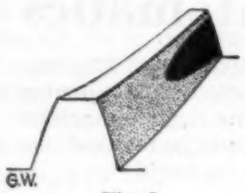


Fig. 5

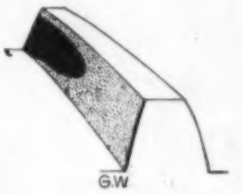


Fig. 6

Figures 5 and 6 show a toe bearing on each side of the tooth and the gear must be moved away from the pinion to increase the lengthwise bearing, which on ratios 1-1 to approximately 4-1, will change the profile bearing to some extent and an adjustment of the pinion may be required as described under "Profile Bearing." This movement of the gear will introduce more backlash and the gear cutting should be changed to properly locate the bearing if this increase in backlash becomes excessive.

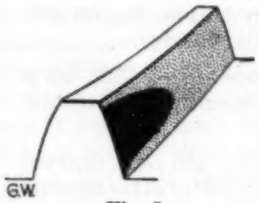


Fig. 7

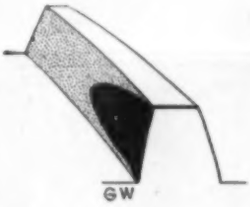


Fig. 8

Figures 7 and 8 show a heel bearing on both sides and the gear must be adjusted towards the pinion to increase the lengthwise bearing, which on ratios 1-1 to approximately 4-1, will change the profile bearing to some extent and an adjustment of the pinion may be required.

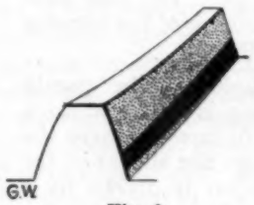


Fig. 9

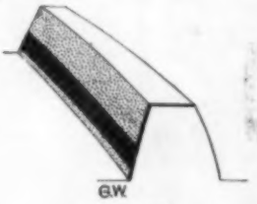


Fig. 10

Figures 9 and 10 show a low bearing on gear tooth which may appear at any position along the tooth. The pinion should be moved away from the gear, and on ratios 1-1 to approximately 4-1, the gear should be moved towards the pinion to maintain the proper backlash. This movement of the gear will alter the lengthwise bearing and several adjustments for both lengthwise and profile bearing may be required to obtain the proper tooth bearing.

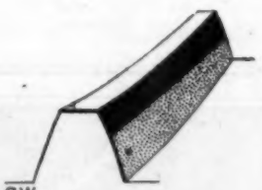


Fig. 11

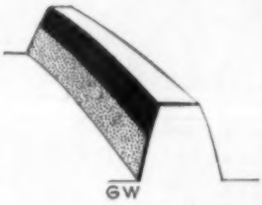


Fig. 12

Figures 11 and 12 show a high bearing on gear tooth which may appear at any position along the tooth. The pinion should be moved towards the gear and on ratios 1-1 to approximately 4-1, the gear should be moved away from the pinion to maintain the backlash. This movement of the gear will alter the lengthwise bearing and several adjustments for both lengthwise and profile bearing may be required.

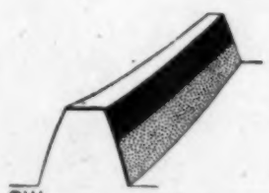


Fig. 13

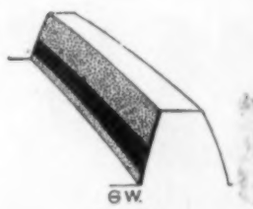
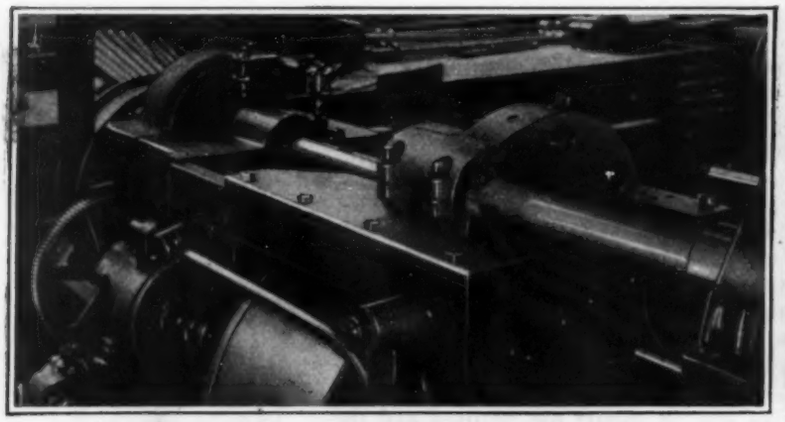
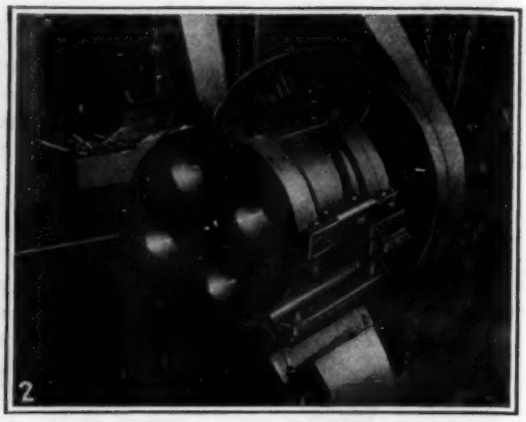


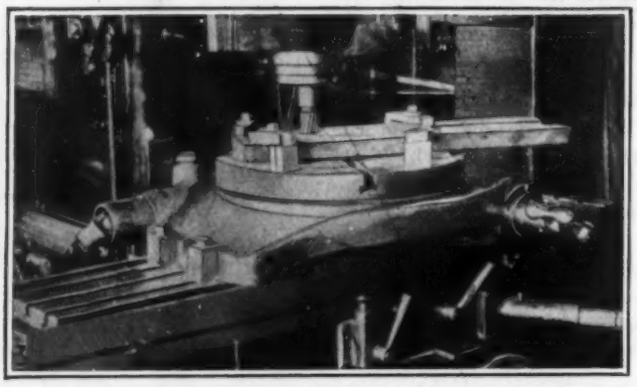
Fig. 14

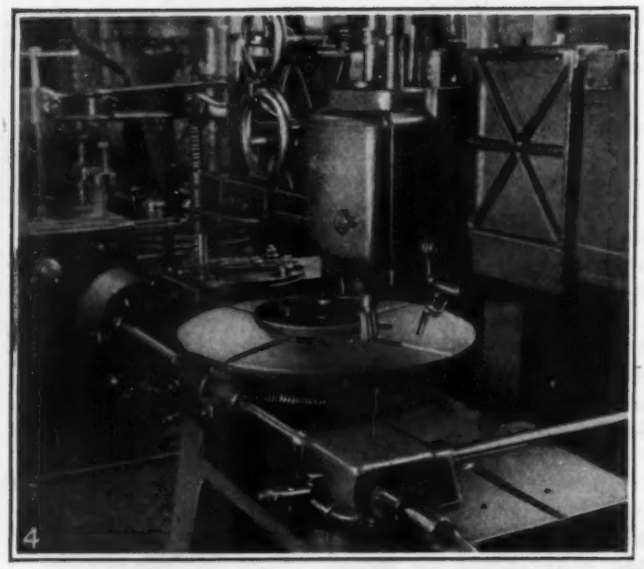
Figures 13 and 14 show a lame bearing. It is possible to adjust the gears and obtain a fair driving condition as indicated in Figure 1, but a poor coast or reverse, and the only method of completely eliminating the trouble is to properly cut the gears.

It must be borne in mind that the adjustment cited should be moderate and if great amounts of adjustments are needed, the mounting and gear cutting must be carefully checked, and the necessary steps taken to correct trouble in the making of the gears or mounting.









Steps in Building Automatics

Fig. 1—Boring holes in tool slides. The bar is held in one spindle of the machine and is driven by the regular machine drive. The cylinder is indexed for successive holes to be bored

Fig. 2—Running-in a spindle cylinder. The cylinder and head of a machine are brought together in this operation and are not separated thereafter

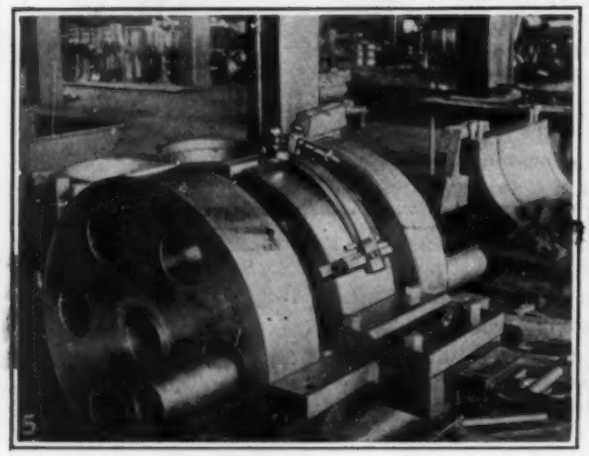
Fig. 3—Milling a chuck-operating slide on a No. 3 Cincinnati machine with rotary table

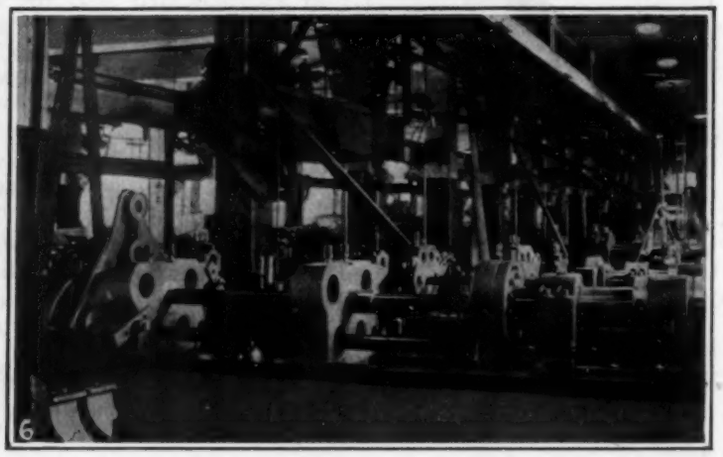
Fig. 4—Milling a peripheral cam on a Garvin profile miller with special attachments

Fig. 5—Scraping the slots for the locking bolt in the spindle cylinder. The gage used for testing the accuracy of the spacing is shown in position

Fig. 6—Boring spindle holes. The partly assembled machine is fastened to a floor plate. Two fixtures to carry the bar are mounted on the shears of the machine and the bar is driven by a belt from the lineshaft to a wooden pulley clamped on the bar

Photographs by courtesy of the New Britain Machine Co., New Britain, Conn.





Where Is the All-Round Mechanic?

By A. L. De Leeuw
Consulting Editor, *American Machinist*

Presenting the subject from the "production shop" point of view—Proportion of population with mechanical bent much smaller now than in the days of the all-around mechanic

THE idea seems to prevail that the all-round mechanic has disappeared, is extinct, is petrified and fossilized. It may be that this is so, but before we mourn him let us ask a few questions. It is well to be sure of the corpse before the funeral.

The all-round mechanic, the old timer, was a man who could do almost anything that had to be done in the machine shop of his days. He was familiar with machine work, with tool work, hand work, and especially with head work. All of them could run a lathe, a planer, a shaper, a driller, and some of them could run a milling machine provided they had seen one. All of them could do tool work to the extent that they could make flat drills, taps and reamers and that they could forge, harden and temper lathe and planer tools and such other things as might come up in the day's work. As to hand work, they understood scraping, filing, fitting, assembling and repair work. And when it came to head work they were just as good as their heads would allow and that was, as a rule, mighty good.

Looking Over One of the Old Timers

Let us resurrect one of these old timers and place him in the present day shop. We would have to ask him, if he is to be an all-round man, to run a lathe, any make, geared head or cone head; any hand screw machine; any automatic bar machine or chucking machine; any thread miller; any gear cutter, hobber, gear grinder, gear shaper, bevel gear shaper or generator; broaching machine, universal or plain milling machine; precision boring machine; and so on.

As to tool work he should be able to make any jig or fixture and that often means, partly at least, designing it. He should be able to make flat drills and twist drills and core drills and oil drills and ordinary taps and ground taps and all kinds of reamers and combined boring tools and whatnots. He should, of course, understand the heat treating and hardening and tempering of the thousand and one varieties of tool steel now in existence. He should be thoroughly familiar with the use of the micrometer and gage blocks and the measuring machine and the comparator. Though it cannot strictly be called tool work he should also be able to make gages, and, mind, these gages should not be made to fit a sample but they would have to be made to fixed dimensions which generally go down to 0.0001 inch.

As to head work, he would need all the head he had before being resurrected and several heads besides to contain all the knowledge necessary for the thorough understanding of an enormous variety of machines.

It is probable that this man would be fired the first day as utterly incompetent.

As a matter of fact the old time, all-round man is dead and we do not want him back. However, he is dead only in the sense that the trunk of a tree is dead. Only the leaves and flowers are really alive. On this trunk have grown a variety of different all-round men. We have at the present time the tool maker. whose knowledge, though confined to an apparently narrow channel, must be at least equally as great as that of the old timer and whose skill must certainly not be less. There is the model maker or experimental man who must be capable of building models or experimenting with very scant instructions, sometimes with none at all, and who must understand mechanics and the art of making things just as did his predecessor. Then there is the die maker or, really there are the die makers, for die making covers such a broad field that it isn't reasonable to expect that a single man can encompass it all. There are die makers for drop forge work, for press work, for die casting work. Each of these men must have a profound knowledge of the operations for which he makes dies and that alone covers a field at least as large as that once covered by the all-round man. Then there is the assembler and the tool setter and the instructor, and the time-study man and still others.

It is not that the all-round man has died, but that he has branched out. The field covered by present day manufacturing operations is so enormously large and contains so many arts, many of which have not been enumerated on this page, that it isn't reasonable to expect that one man should be versed in all of them. Such a man would have to be a super-man.

All Good Material Now Used

The idea is still prevalent that there is a dearth of good mechanics. This may well be the case. It may well be that we have need of more good men than we can find, but this does not prove that there are fewer good mechanics than there were in olden times. It seems to be the case that formerly only a small part of the available material was used while now we use all of it and want more. Not everybody can become a good mechanic any more than he can become a good doctor or a good poet, and certainly the natural bent or gift must be present before it can be developed.

In olden times when shops were few there was a certain percentage of the population which had that gift and some of them would drift from the farm to the shop, develop themselves and become all-round men but probably many more stayed back on the farm and never saw the insides of a shop. Even at that we had all the mechanics which the industry needed. Now-a-days practically all of the men who have this bent for mechanics

enter the mechanical field and become something or other, either an engineer or executive or foreman or tool maker or die maker, but even at that there still seems to be a shortage. What has taken place is simply this, that whereas formerly there was a larger percentage of the population possessing the mechanical bent than was necessary for the industry, now-a-days there is so much more industry that even all of those who have this mechanical gift are insufficient to fill the demand entirely.

Famous Machinists of History

By H. H. Manchester

John Rennie (1761-1821)

John Rennie was born in 1761, at Houston Mill, where his father was owner of a moderate estate. On the estate Andrew Meikle rented a mill and had a millwright shop. Meikle was a skilled mechanic who invented a threshing machine much used in England.

As a boy Rennie played around Meikle's shop, and took particular interest in his work there. At twelve, John was sent to the Dunbar high school, where he was particularly good in mathematics, and substituted as teacher until the school got a new one.

At sixteen, he returned home and went into Meikle's shop to learn the business of millwright and machinist. At Aitcheson's flour mills, near Edinburgh, Rennie in making repairs put in cast iron pinions instead of wooden trundles.

In 1780, warned perhaps by Meikle's limitations due to lack of education, Rennie entered the University of Edinburgh, but continued to work as a millwright and machinist in the summers.

Two years after finishing Edinburgh, Rennie was asked by Watt to put in the gearing in the new Albion flour mills. In doing so Rennie adapted iron gearing with carefully cut teeth. The job lasted three years, but was completed in 1788.

In 1791 the mills were destroyed by fire, and Rennie set up a shop on part of the site. He soon became well known as an engineer. He built various canals, drained the Lincoln and Cambridge Fens, constructed the Waterloo and new London bridges, helped design the great new London docks, and reconstructed the harbors at Holyhead and Ramsgate. The Plymouth breakwater and the famous Bell Rock lighthouse were also his work.

He died in 1821, one of the best known of the early engineers of England.

Johnson's Slant on Cut-Prices

By John R. Godfrey

I LISTENED in the other day while old man Johnson read the riot act to a machine-tool salesman in his office. And if his talk could be broadcast for salesmen generally, as given, it might do a heap of good.

Johnson was in the market for a few machines and he had specifications and prices from a dozen builders. Between young Tom and the production man, they had about decided on the machines to buy. The old man isn't much of a hand to buy on price; if he believes a machine is worth the money and it suits him, he is pretty apt to buy it.

I blew in the other morning just as the salesman from a good sized machine dealer had been stressing the price question and old man Johnson was sizzling hot and rarin' to go. He got started just as I got inside.

"Young man, you make me tired. Though really I ought to cuss your boss and I would if he were here. Here you machine-tool men have been howling about prices being too low—always been too low. So dern low you can't pay good wages and so you lose your good men to us millionaire motor builders. You preach poverty, that prices ought to go up, and then you come out here and offer to cut 'em twenty per cent if I'll give you an order for two machines. Not only that but you offer me more money for the old ones than they are worth and if I took your bait you'd ask me to scrap 'em to save you the cost of carting them away. And yet you have the nerve to wail about prices being too low.

And What About the Boss?

"And that is not all either, young man. I happen to know that your boss and other builders have given their word not to cut published prices. Yet he sends you out here to try and pick up an order by doing that very thing. Either you'll lose money on the deal or else your prices are not so darned low as you've been telling.

"Personally I think they are too low. You machine-tool men give more for the money than is given in any class of machines built in anywhere near similar quantities. You have a comparatively limited market and you can't use high-production methods. The *American Machinist* has been telling us users of lathes and such that the prices are too low, and I believe 'em. And yet your boss sends you out here to tip over the whole apple cart by cutting prices twenty per cent.

"I'm not going to take it, son, though it is a big temptation because I could use your machine almost as easy as the other. But I won't encourage gyp deals in machines any more than in motors. Unless you fellows can be at least as honest as horse traders and stick to your agreement once in a while, I'll lose all sympathy.

"You seem to forget that cutting prices always breeds distrust. How do I know that you haven't offered my competitor twenty-five per cent? When a man begins to break his agreement there's no telling how much he'll break it. So I'll stick to the builder who sticks to his price list—then I know no one else gets the same machine I do for any less money.

"There's an old saying, son, that a real man passes at his own valuation. It isn't as true as it ought to be. But the users of machine tools are going to have mighty little sympathy for the builders of "The Master Tools of Industry" if they sell machine tools by the tactics of the cheap clothing store on New York's east side."

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Drilling and Milling Fixtures for Airplane-Instrument Work

BY CHARLES F. HENRY

The two fixtures shown are used in making one of the airplane instruments built by the Pioneer Instrument Co., Brooklyn, N. Y.

The fixture shown in Fig. 1 is for drilling 21 holes in the work, the holes varying from that made by a No. 53 drill to $\frac{3}{8}$ in. in diameter. As can be seen, the drilled holes are on all six sides, the fixture being provided with feet or supports for each side.

The casting is located by the large extension or spigot, as our English friends call it, and the two ears outside of it. Fig. 1 shows how the casting fits into the jig. It is held by eccentric cams *A* and *B* which clamp it in place. The cross handles are a sliding fit in the eccentric plugs but are held in place by helical springs wound enough smaller than the cross handles to grip them firmly as they are pushed through the springs. The springs fit around the handles in the hollows of the eccentric plugs and make a very convenient method of holding them so that they remain in place, but so they can be easily removed at any time. The springs are at points indicated by *S* in Figs. 2 and 3, which also gives a good idea of the construction of the jig itself.

The holes in the ears at *C*, Fig. 1, are drilled through from the right hand, the drill being additionally supported by a bushing in the lug between the ears. There is also a plate jig, with bushings, which goes over the open side of the box jig and enables the holes for the cover screws to be drilled in the bosses shown inside the case.

The next operation is turning the outside of the

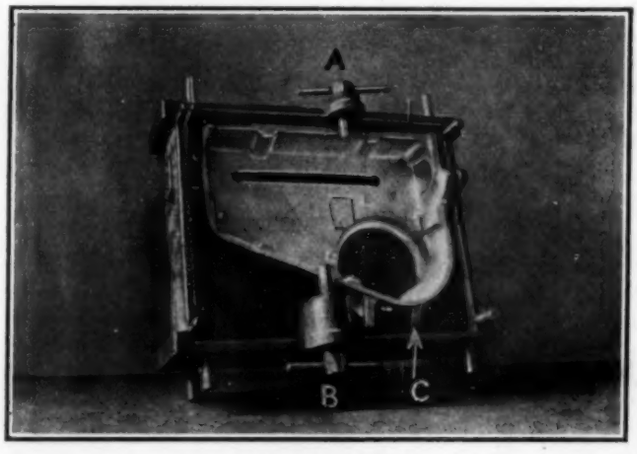


Fig. 1—Casting in drilling fixture

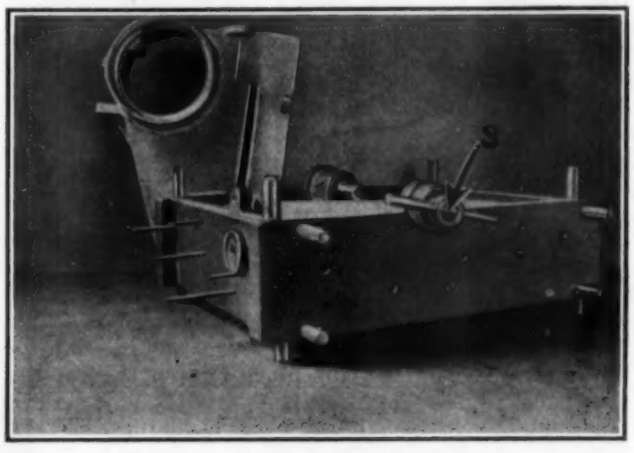


Fig. 2—Showing drills and locking cams

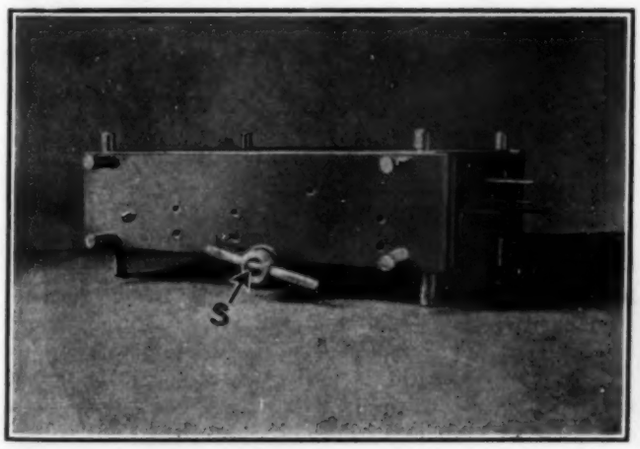


Fig. 3—Fixture turned over

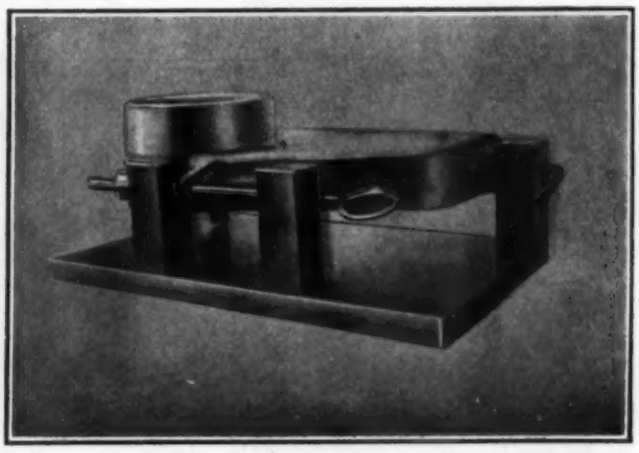


Fig. 4—In position for turning hub

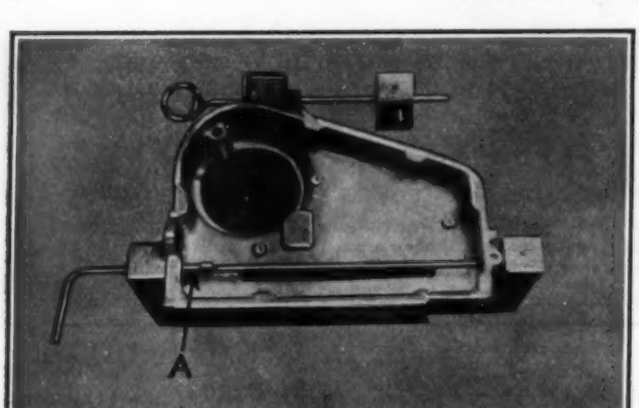


Fig. 5—Castings ready for milling

large projection and facing it. The turning is done with a sweep tool which is virtually a hollow mill, driven by the spindle of a drilling machine. During the operation the case is held in the fixture shown in Fig. 4 and supported by the rods shown. The rods are a snug fiit in the holes already drilled. One hole in

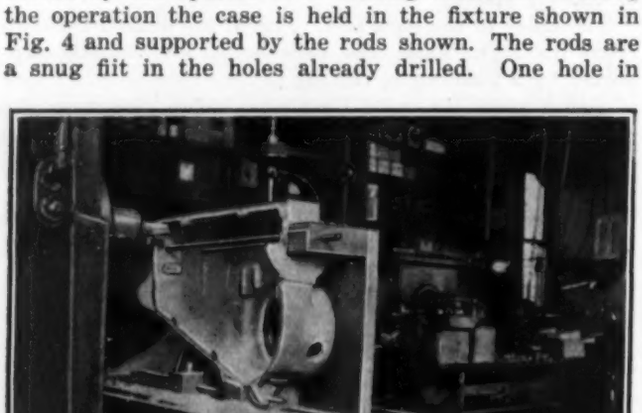


Fig. 6—Milling the edges

the case is larger than the other one on the opposite side, so a slip bushing, as at *A*, Fig. 5, is used over the rod.

With the casting in the fixture, as shown in Fig. 5, the fixture is taken to the milling machine, as in Fig. 6, and the edge of the casting surfaced all around to receive the cover. The end mill shown, is used to sur-

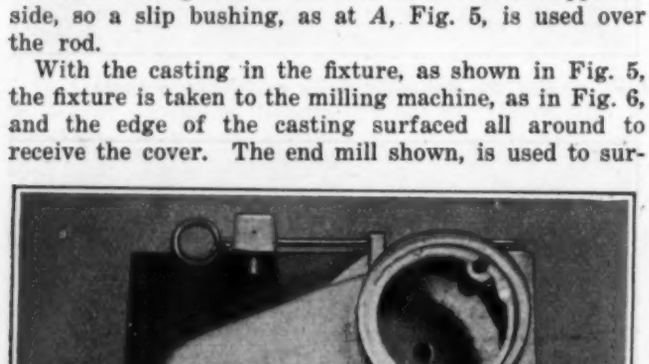


Fig. 7—Casting reversed for milling slot

face the edge, as it can follow the contour of the case easily by operating the two table motions.

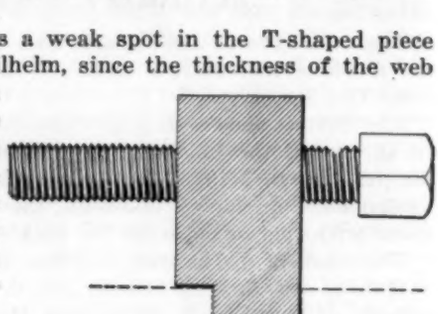
By reversing the casting in the fixture, as in Fig. 7, the slot shown can easily be milled. The fixtures are designed to secure ease of handling and the working of all surfaces. Their flexibility makes it possible to handle all the operations with but two fixtures. The superintendent, B. C. Goldsborough, is responsible for their design.

A Simple Planer Accessory—Discussion

By T. Heaton
Blackburn, England

On page 749, Vol. 60, of the *American Machinist*, there was published an article by F. J. Wilhelm under the title given above.

I think there is a weak spot in the T-shaped piece shown by Mr. Wilhelm, since the thickness of the web limits the length of the tapped hole for the screw and it would not be long before the thread would be stripped from either the hole or the screw.



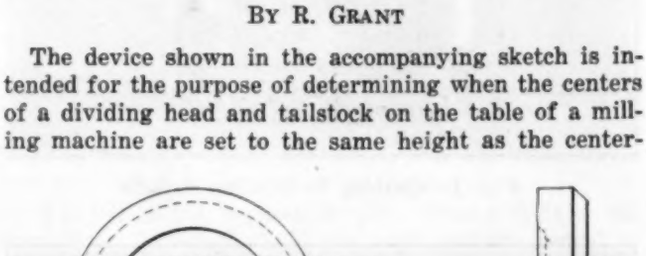
A substitute for the T-shaped piece

But why have a T-shaped piece? There is very little lifting strain on the piece and it might as well be made of 1¼-in. square mild steel with a groove through one edge, as shown in the sketch. Such a piece will be cheaper to make than the one shown by Mr. Wilhelm and will give a good length of tapped hole for the screw.

Setting Index Centers to Relative Height

By R. Grant

The device shown in the accompanying sketch is intended for the purpose of determining when the centers of a dividing head and tailstock on the table of a milling machine are set to the same height as the center-



Gage for setting index centers to relative height

line of the machine spindle. It is made from a rectangular bar of tool steel 1x2 in. in section, and a disk of cast iron 1 in. thick by 6 in. in diameter.

The bar of steel is carefully centered and is turned back for a distance of 2 in. from one end to receive a dog. The remainder of the length of the bar is turned parallel at as large a diameter as the stock will allow,

leaving the narrower dimension untouched. Since parallelism is necessary, it is better to finish this part of the work by grinding.

The disk of cast iron is attached to one of the flat sides of the bar by screws and dowels. It is essential that the disk be round, and that it be faced square with the turned portion. It must be carefully located on the bar so that the distances from the ground surfaces of the latter to the periphery of the disk, measured on a plane parallel with the face, shall be equal in both directions.

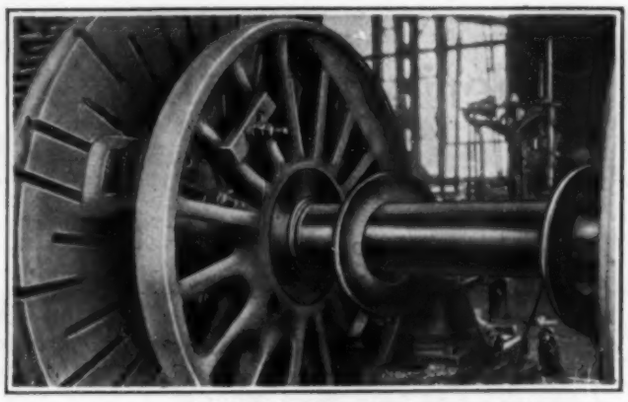
To use the device it is placed between centers of the dividing head and tailstock and the centers adjusted to bring the bar parallel with the surface of the table. This can be done by means of an indicating surface-gage applied over the circular portion of the bar at both sides of the disk. The face of the disk is then set square with the table.

An indicator is attached to the machine spindle, or to the end of a short arbor, in such a manner that it can be revolved around the disk, keeping the indicating button in contact with it. As the indicator moves from one position to another, the knee and table of the machine can be moved until the reading is the same in all positions, at which time both the index and spindle centers will be at the same height.

Safety Precautions on the E. P. & S.-W. Railway

By Tom J. O'Reilly

It is well-known among those familiar with foundry work that blow-holes are liable to develop in the hub of a wheel casting. In order to reduce the possibility of driving-wheel failures to a minimum, the hubs of all new wheels machined in the El Paso shops of the El Paso & South-Western Railroad are counterbored to a depth of 1 in., as shown in the illustration. This is sufficient to open any holes large enough to be of moment and a number of large holes have been found that would not have been uncovered if the wheels had been counterbored only to the usual depth of ½ in. New liners 1 in. thick are used, and it has been found



Counterbore in hub of locomotive driving-wheel

that they are more efficient than the ½ in. liners. They wear evenly, and one set wore less than ⅛ in. in seven years.

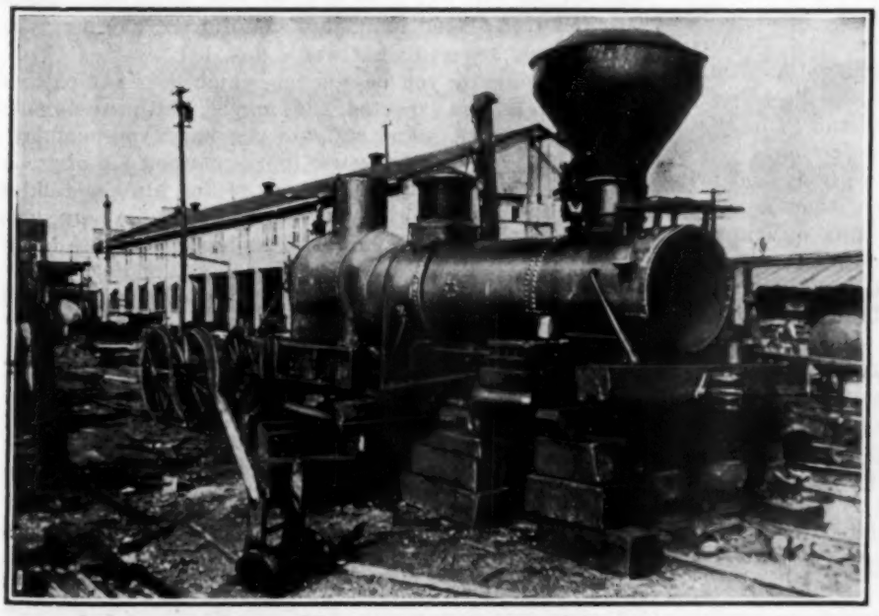
Work in a Large Southern Repair Shop

By Clifford H. French

The Merrill-Stevens Dry Dock and Repair Co., Jacksonville, Fla., repairs everything from large steamships down, including locomotives. The extent of some of the locomotive repairs can be judged from Fig. 1, which shows an old wood burner that has just had a complete new boiler, the smoke arch, smoke stack and sand box only being old.

One of the jobs that came in required the turning of a long shaft of fairly large diameter. The steadyrest that came with the lathe was not equal to the task, so the superintendent, W. J. Boote, designed the one shown in Fig. 2 and had it built of steel plates and angles. The outline was cut with the torch as was the hole in the center.

The base was made of heavy angles, while the two plates which constitute the frame or body, are of ½-in. plate, spaced apart by suitable thimbles made of steel pipe. Regular steadyrest jaws were used, held between guides made of angles. While the construction might not be recommended as ideal, the steadyrest served its purpose and has proved to be very substantial.



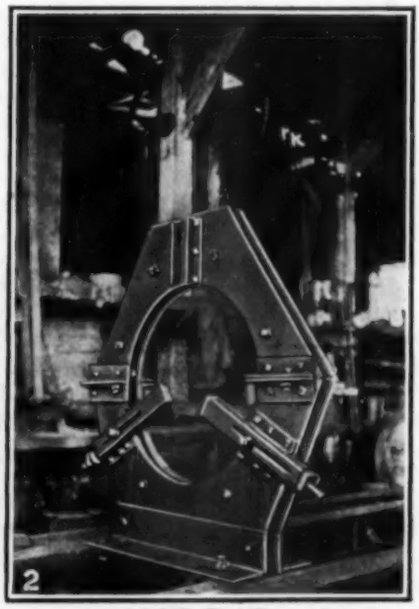


Fig. 1—Overhauling wood-burning locomotive. Fig. 2—Plate steel steadyrest

American Machinist

Established 1877

KENNETH H. CONDIT AND FRED H. COLVIN, *Editors*

Getting in Line

A LETTER has just reached us signed, "A Mechanic's Wife." Consequently we are unable to answer it as we should like but we can at least use its message as a text for a short editorial.

Our correspondent says, "My husband is a skilled mechanic who at present is foreman of a machine shop but expects to be out in a short time as the factory now is in the hands of a receiver. More and more men every year are leaving the shops to go into other business. Surely some way can be found to induce toolmakers and machinists to stay at their trade and also to reward the man who has given the best years of his life to it."

In this morning's paper we find a report from Secretary Hoover in which he says that the prices of farm products are getting more nearly in line with other prices than they were a year ago. This is good news and will make for prosperity and the elimination of dissatisfaction.

In view of the letter we have quoted, which states a case only too common in the machinery industry, there is a crying need for another lining up, the lining up of wages of skilled workmen. Certainly the wages of carpenters, bricklayers and plumbers are out of line with those of machinists. Perhaps the rising tide of business will solve the problem in that scarcity of trained men will induce bidding for their services. But in any event the situation is a serious one and one that calls for careful thought from those entrusted with the direction of our shops.

The Value of Real Personnel Work

IN SPITE of the set-back which personnel work received after the war, it is proving its worth in many plants. Instead of being a sop to labor it is proving to be a valuable agency for securing the "family" feeling which results in contentment, in the belief that there is a square deal for every man, and in promoting not only harmony but quality in production.

Personnel work is much more than hiring and firing. The real personnel manager is more than a clerk or czar who decides the fate of applicants or employees. He or she takes the place of the owner of the old days when shops were small and the bosses knew every man by his first name and all his family troubles.

It is refreshing to find some of the personnel managers young men and women who realize the need for closer human relationship and a vision as to the possibilities of placing people in the job for which they are best fitted. While it is not easy to place a money value on this work, it is gratifying to note that in factories in which personnel work is at its best, the results are evident and are appreciated.

There are, of course, many theories as to the way in which work of this nature should be handled. But best results depend on suiting the method to the condition that exists in each establishment. There is no work which calls for a greater display of that too uncommon commodity known as common sense. Few professions are of more value to industry and it is gratifying to note that it is being recognized by the more progressive concerns in various lines.

Conservation

ONCE again the governors of the various states are gathered in conference and are considering the conservation of natural resources. Conservation has never been taken with sufficient seriousness by Americans because the resources of their wonderful country have seemed limitless. Yet the passenger pigeon, once so numerous as to be a pest, is gone; the bison exists only in privately owned herds; half of our petroleum resources, according to reliable estimates, have been exhausted; our coal may last a hundred years, more or less; our timber is being used up much faster than it can be grown.

Such facts have finally brought those in authority to a realization of the necessity for action. In the meantime industry, although it must plead guilty to many criminal wastes, is taking steps toward conservation on its own account. Foremost in the ranks of industrial conservators must be ranked the machine designers. They are constantly at work in an endeavor to replace human hands with machinery and thus release the hands for needed service elsewhere. Perhaps this is not conservation in the sense in which people usually consider it, but isn't conservation of human energy and effort as important as conservation of materials?

Just Suppose

JUST suppose you got a job somewhere at a higher rate than you had expected, in fact, at a higher rate than you deserved. And that you knew it. And suppose you found a counterfeit dollar in your pay envelope; and you showed it to your employer; and he told you you could lump it if you did not like it. What would you say and what would you do?

Now suppose you have a job which does not pay you as much as you expected, and, maybe, not quite as much as you deserve. And suppose you hand your employer a counterfeit hour's work in your week's doings, an hour spent for yourself instead of for him, in talking, loafing or soldiering. And suppose, when he points this out to you, you tell him he can lump it if he doesn't like it. What do you expect *him* to say or do?

Well, you say, that's different; wilfully issuing counterfeit money is a penitentiary matter.

That's true, but—

Just suppose.

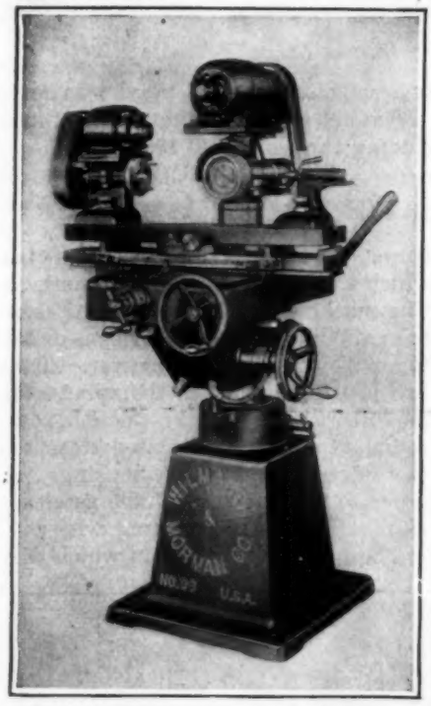
Modernize and the world moves with you;
Stand pat and you stand alone.

Humanity is on the march. You cannot keep in step with a shop full of obsolete tools.

Shop Equipment News

Wilmarth & Morman No. 99 Universal Tool and Cutter Grinder

The Wilmarth & Morman Co., Grand Rapids, Mich., is now marketing its universal tool and cutter grinder in an additional size, designated No. 99. The general design and characteristics of this machine



Wilmarth & Morman No. 99 Universal Tool and Cutter Grinder

follow the No. 1 machine made by this company, the main difference being that the recent model is somewhat smaller in work capacity.

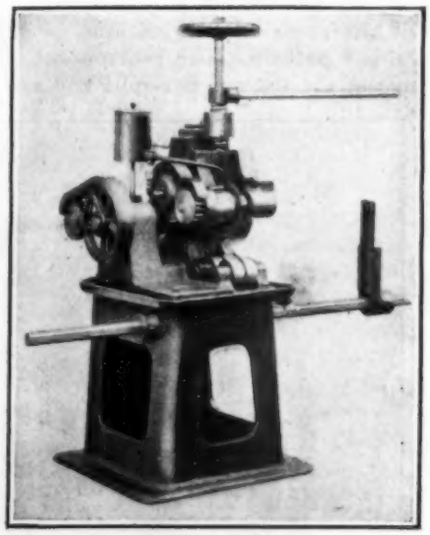
Both belt- and motor-driven models of the machine are made, the motor-driven machine being shown in the accompanying illustration. The longitudinal feed of the table can be controlled from the front or rear of the machine and the micrometer adjustment for the table can be put into use at any angle of the table. In the motor-driven machine all the electrical controls are mounted on the knee below the table and directly in front of the operator. The various grinding attachments used are interchangeable with the No. 1 machine.

The longitudinal movement of the table is 16 in. and work up to 10⅜ in. in diameter by 20 in. long can be mounted on the centers. The vertical and transverse movements of the table are 8 in. and the working surface of the table is 5½x32 in. The usual standard equipment and attachments can be furnished.

B & K No. 4 Rolling Cutter

Bignall & Keeler, Edwardsville, Ill., have recently added a length gage to the rolling pipe and tubing cutter which they manufacture. The machine with the gage in position is shown in the accompanying illustration, and is designated No. 4.

The device has sufficient capacity to cut off pipe or tubing from ¼ to 4 in. in size and is so arranged that the pipe can be passed under the cut-

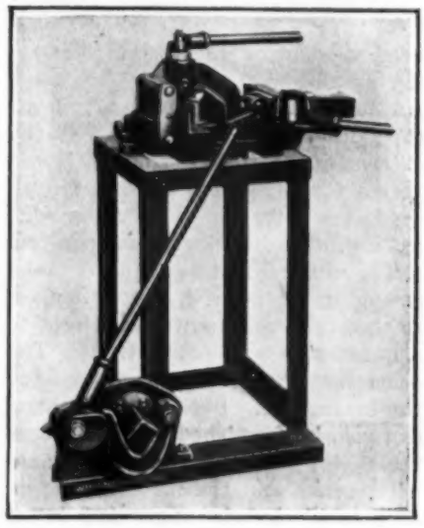


B & K No. 4 Rolling Cutter

ter from either side. The cutting is accomplished by adjusting the height of the cutter with a handwheel until it just clears the pipe, and then using a hand lever to press the cutter into the pipe. The lever is attached to a nut on a coarse-pitch thread. The rolls are mounted in roller bearings.

Whitney No. 45 Combination Notcher, Bender and Shear

A recent product of the Whitney Metal Tool Co., 91 Forbes St., Rockford, Ill., is a metal stand on which its notching, bending and shearing machines used for angle iron are



Whitney No. 45 Combination Notcher, Bender and Shear

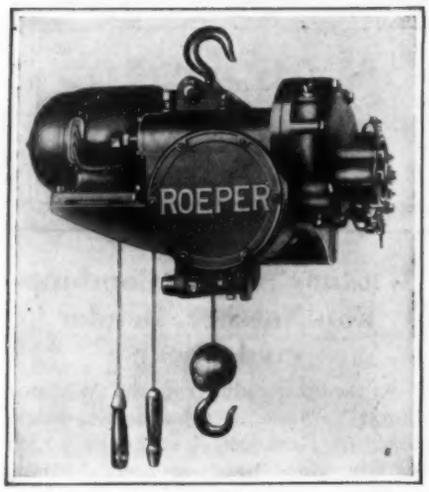
mounted. The arrangement of the apparatus is shown in the accompanying illustration, the notcher and bender being located on the top of the stand, with the shear mounted on a projection near the floor.

Roeper Type R Electric Hoist

The Roeper Crane & Hoist Works, Inc., Reading, Pa., has recently placed on the market a small electric hoist, designated Type R.

The mechanism is driven through worm gearing, the worm being placed above the gear and the worm shaft being equipped with a ball thrust bearing. A standard motor is used and rests on its feet on an extension of the hoist frame. The main frame of the device is a one-piece casting and contains all bearings.

Wrought-steel suspension plates connect the drum shaft to the over-



Roeper Type R Electric Hoist

head suspension members, thus relieving all tension on the castings. An automatic stop of the trip-lever type provides safety control at the extremities of the lift and can be adjusted for any length of hook travel. Since the drive for the drum is self-locking, a load brake is not required.

The motor has a mechanical brake acting in series with the controller, so that the load is always brought to a quick stop without drifting. The controller is a single-speed device of the drum type. Push-button control can also be furnished, in which case the motor is equipped with a magnetic brake and the machine has an adjustable electric upper and lower limit switch.

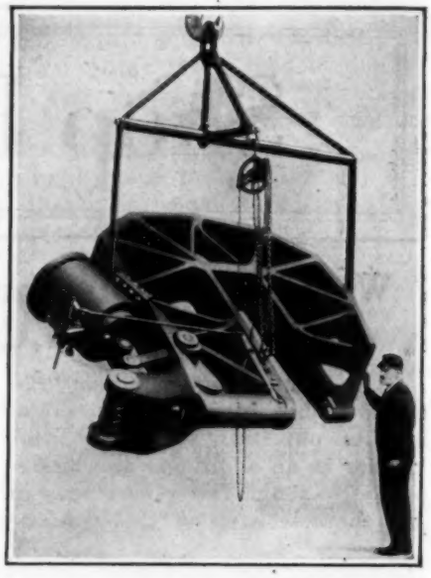
The hoist shown in the illustration is arranged for hook suspension but the apparatus can also be furnished with plain or geared I-beam trolleys with roller-bearing wheels.

Hanna Large Portable Riveter

A large portable riveter with a reach of 75 in. and a gap of 18 in. has recently been placed on the market by the Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill. It is capable of exerting 150 tons pressure on the dies, using air at 100 lb. per sq. in. in a 22-in. cylinder. A special bail suspension makes it possible to suspend the riveter in either of two positions or in any intermediate position. Due to the arrangement of the suspension it is easier to raise or lower the die axis by the bail when riveting vertical seams than by raising or lowering the entire machine.

A hand-operated triplex chain block is incorporated in the bail. This device establishes a third point of riveter suspension and is the means by which change of position is obtained. The frame of the machine is a one-piece casting in the form of a truss and has no central web. This design is used for lighter construction, and casting strains are reduced by making all members of substantially equal cross-section.

The pressing mechanism is the usual Hanna combination of toggles merging into a lever action. This apparatus develops a known and predetermined maximum uniform pressure during the last half of the piston stroke. This includes about the last half inch of the die travel. The action helps to insure the tightness of the driven rivets without the use of the die screw adjustment to overcome ordinary variations in length of rivets, thickness of plates, etc. The dies are pressed together under sufficient pressure and the rivet is followed up by the dies until it is sufficiently cooled to take its set.



Hanna Large Portable Riveter

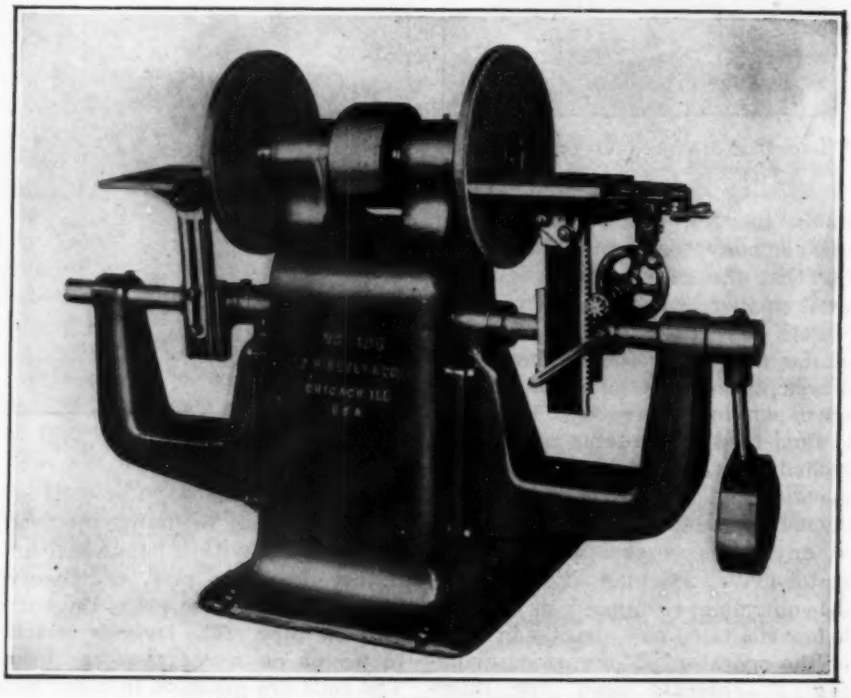
The net weight of the machine, including the bail, is 17,150 pounds.

Besly No. 108 Ball-Bearing Disk Grinder

A ball-bearing disk and ring-wheel grinding machine with an outboard rocker shaft support has recently been developed by Charles H. Besly & Co., 118 North Clinton St., Chicago, Ill., and is now being marketed. The machine is designated No. 108 and is shown in the accompanying illustration.

The frame of the machine is of the box pattern. The bearing housings at the top are not split and are bored to receive the bushings in which the ball bearings are mounted. The machine spindle is made of carbon crucible steel and carries a driving pulley 10 in. in diameter. The ball bearings in which the spindle is mounted are of the double-row radial type and are located close to the edge of the base housing, in order to support the spindle as close as possible to the grinding wheels.

The flanged bushings in which the



Besly No. 108 Ball-Bearing Disk Grinder

bearings are carried are fastened to the housing by screws. The outer races are not locked in position endwise, but the inner races fit the spindle snugly and are locked in position. Thrust bearings of the self-aligning type are provided and are mounted on each side of a circular aligning ring that is rigidly secured in the right-hand housing. A collar with threaded adjustment holds the thrust bearings in position on the spindle and permits taking up the endwise play in the spindle at any time. The collar has a locking device by which it can be secured to the spindle after the adjustment is made. The wheel collars are screwed up against large shoulders on the ends of the spindle and are locked in position with taper pins.

The outboard table supports are separate units and are attached to machined pads at the ends of the base casting. The top bearings of the support are bored to receive the rocker shaft, the inner bearing extending through a cored hole into the base of the machine. The inner bearing is faced on both sides to provide suitable contact for thrust collars that hold the shaft in position. The rocker shafts can be oscillated or rigidly clamped in position, as required by the work being done.

The table at the right of the machine is provided with a hand-operated feeding mechanism, in addition to the adjustments necessary to position the table in front of the wheel. This table oscillates across the face of the wheel with the work and is fed toward the wheel by means of a hand lever operating a pinion and rack mechanism. A micrometer stop is provided for gaging the work while grinding. The table surface is 8x12 in. and is fitted with suitable slots for holding work fixtures.

The tilting table at the left of the machine has no feeding motion. This table is used in a stationary position and its stand is clamped rigidly to the rocker shaft. The table top is 8x11 in. and can be tilted to an angle of 45 deg. The table is adjustable along the rocker shaft between bearings.

The disk wheels used on the machine are 20 in. in diameter and are attached to the wheel collars by screws. Spiral abrasive disks made by this company can be cemented to the faces of the disk wheels, and are made in all grains and sizes to suit a variety of work.

Republic Recording and Indicating Pyrometers

The Republic Flow Meters Co., 2240 Diversey Parkway, Chicago, Ill., has recently placed on the market a line of indicating and recording pyrometers, together with the usual thermocouple accessories.

The recording instrument is illustrated in Fig. 1. The clock has a complete time element with the usual escapement and its own mainspring, and performs no other function than to release the operating energy through the power escapement. Two independent charts are used instead of printing two scales on one piece of paper. Standard charts are carried in stock with temperature

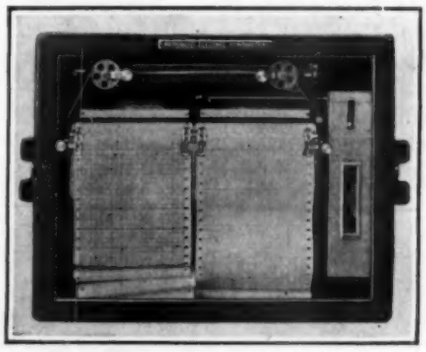


Fig. 1—Republic Recording Pyrometer

ranges from 32 to 800 deg. F. up to 32 to 3,000 deg. F. The charts are 6 in. wide, the actual scale range being 5¼ inches.

A clutch on each chart driving drum permits the operation of either chart as desired and the charts last 1,200 hr. A carbon ribbon is automatically advanced across the face of the chart and the instrument pointer moves freely between a depressor bar and the back of this ribbon. The pointer is deflected in proportion to the temperature at the hot junction of the thermocouple and there is no frictional resistance at the pointer.

When the carbon ribbon has advanced to a position covering a knife edge, that runs the width of the charts and is located directly beneath the depressors, the depressors drop and a dot is made on the chart. The depressors then rise, the carbon drops back and the dot just made is visible. All the mechanism of the instrument is mounted on a swinging bracket and is accessible. The instrument has a high electrical resistance.

A small toggle switch is built into the instrument. When closed this switch short-circuits the magnetic field and damps the motion of the pointer when in transit.

The wall-type indicating pyrometer is shown in Fig. 2 together with a moisture-proof 12-point selective switch. Die castings and bakelite are employed in the construction of this instrument. The scale is wide so that the graduations are open and easily read. Four thermocouple elements can be supplied and are standard. These employ both precious and base metals.

Fig. 2—Republic Wall-Type Indicating Pyrometer

Moisture-proof thermocouple heads are furnished as standard equipment for the thermocouples. The heads are made in three pieces of which two are die castings. A bakelite insulator is held in place when the cover is secured. The head is tapped for flexible conduit.

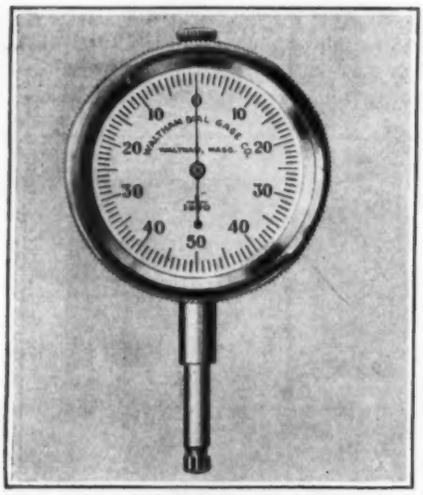
Waltham Model B Dial Indicator

A recent product of the Waltham Dial Gage Co., 85 Myrtle St., Waltham, Mass., is the Model B. dial indicator shown in the accompanying illustration. In the design of the instrument an endeavor has been made to insure long life and continued accuracy.

The indicator is dived into two units. The case unit consists of case,

rack, guide pin, guide block and rack spring. The plate unit incorporates the wheels and pinions and their accompanying mechanism, and can be removed from the case unit without disturbing any part of the latter.

The instrument has a range of 0.3 in. and is graduated to read in thousandths. The dial can be set at the zero reading for any position of the pointer. The over-all diameter of the indicator is 2¼ in. A lug is attached to the back of the device and has a ¼-in. hole for attaching to machines.



Waltham Model B Dial Indicator

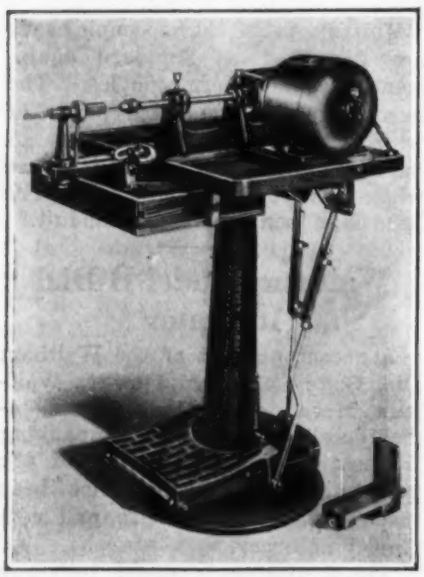
Hubbell Motor-Driven Tapping Machines

A recently marketed product of Harvey Hubbell, Inc., Bridgeport, Conn., is a line of motor-driven tapping machines. The machine has sufficient chuck capacity to handle taps up to ⅞ in. in diameter and is especially adapted for tapping small brass parts.

The mechanism of the machine is mounted on a table at the top of a floor pedestal. The driving motor is carried on a tilting platform and drives the spindle through friction cones. The tilting of the platform and the pressure between the friction cones is controlled by means of a treadle. The treadle also controls the electric switch and the removal of the foot from the treadle automatically stops the motor.

The machine shown in the accompanying illustration is fitted with a plain tapping spindle, but the addition of multiple tapping equipment and a reverse spindle fixture adapts the machine for a variety of work. The reverse spindle fixture makes it possible to tap two holes simultaneously from opposite sides of the piece.

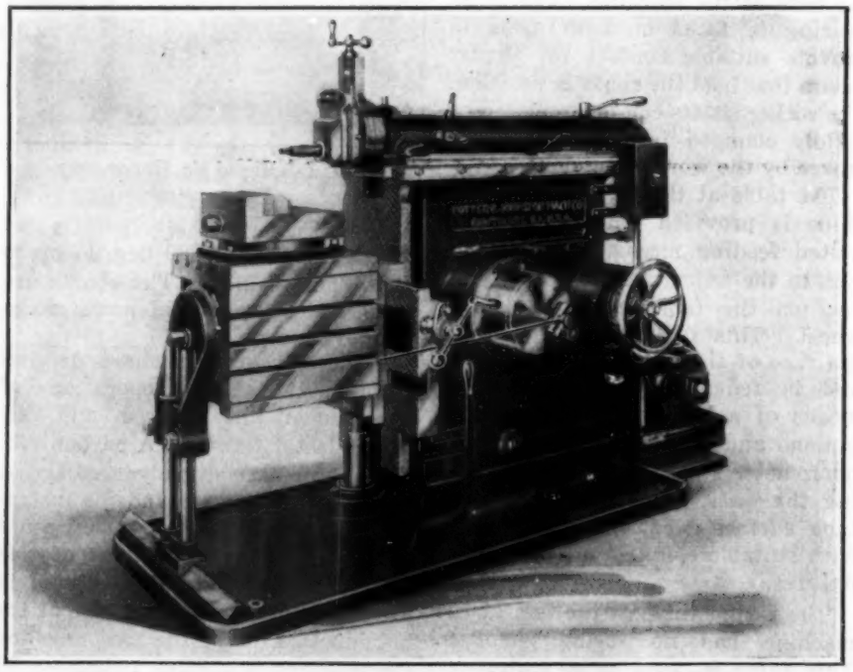
A ¼-hp. motor is used to drive the machine, the spindle of the machine shown in the illustration running at 1,800 r.p.m. When the multiple tapping fixture is used the spindle speed is 1,500 r.p.m. The over-all height of the machine is 38 in. and the crated weight is 375 pounds.



Hubbell Motor-Driven Tapping Machine

Potter & Johnston Improved 24-In. Shaper

The Potter & Johnston Machine Co., Pawtucket, R. I., has recently added several improved features to its 24-in. universal shaper. These include an outboard table support, a pan base, an elevating screw of the telescoping type, and a friction clutch control in the driving mechanism. The machine is adapted for toolroom and repair work.



Potter & Johnston Improved 24-In. Shaper

The machine can be driven through a single belt pulley or arranged for motor driving, a 5-hp. motor of the constant-speed type being recommended. The speed changes are obtained through a six-speed quick-change gear box. The friction clutch is incorporated in the driving pulley and the clutch control lever is placed in a convenient location for the operator. When a motor is used for driving, it is mounted on an extension of the frame and transmits its power through a silent chain.

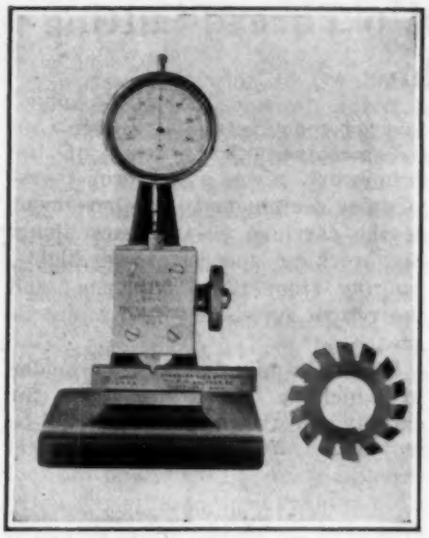
The ram has a quick return and its slide is of sufficient length and accuracy to insure proper action at the extreme limits of the stroke. The length of the ram stroke is 24 in. and the cross traverse is 23 in.

A swivel table is regularly furnished and has an auxiliary tilting side for obtaining compound angles. The swivel table has T-slots on two sides and revolves through an angle of 90 degrees. An outboard support for the table can be furnished, if desired. The table surfaces are 17½ in. long and 15 in. wide. A 16½-in. vertical movement for the table is provided.

Izod Impact Specimen Gage

For inspecting specimens to be tested on the Izod impact testing machine, the F. H. Bultman Co., Cleveland, Ohio, has recently placed on the market a gaging device. A standard specimen for the Izod test consists of a bar 10 mm. square in section, with a 45-deg. notch milled 2 mm. deep. It is important that all specimens shall have the same area of metal beneath the notch, this being the area broken in the test.

The purpose of the apparatus is to facilitate the inspection of the specimens and insure that the same standard is maintained by all users. A hardened and ground standard specimen is furnished and all specimens are made to conform with it. The standard is first placed on the table of the gage and the dial reading is taken with the V-bar of the device in the bottom of the groove of the specimen. The specimen itself



Izod Impact Specimen Gage

is then gaged and its variation from the standard is determined by the dial readings. A forming cutter for milling the notches is also furnished.

Waterbury Farrel Pinch Pointing Machine

A machine for automatically producing conical points on wood screw and drive screw blanks, "pyramid" points on escutcheon pins and wire nails, etc., is now being marketed by the Waterbury Farrel Foundry and Machine Co., Waterbury, Conn. The machine is provided with a hopper feed and chute which delivers the headed blanks into a notched dial in an index head. Suitable adjustments enable the accommodation of blanks up to 2½ in. long under the head and with a maximum diameter of ¼ inch.

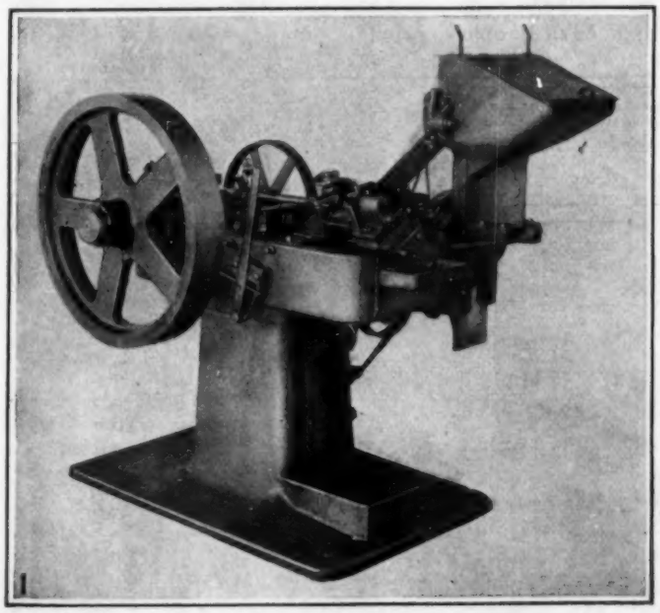
The index head is located at the same angle as the feed chute so that the blanks pass directly to the dial. As soon as the dial has indexed 90 deg. and brought the blank into line with the dies, the die in the gate advances, partly displaces the blank from the dial, and pinches its end against the stationary die attached to the bed. Means are provided to prevent the blanks from tipping in the dial and to assure symmetrical points and uniform length.

As soon as a blank has been pointed it is pushed back into the dial by a spring-actuated slide. The dial then continues to index and carries the blank around until it slides out by gravity. The dial is indexed by a ratchet and pawl mechanism in the index head, actuated by the gate. There is a locking device in the index head that prevents the dial from moving during the pointing operation.

The connection between the gate and the index head consists of a closely wound spring, so constructed that it acts as a solid connection on the forward stroke and will yield on the backward or indexing stroke if a blank becomes lodged improperly in the dial. The blank is released on the next movement of the gate.

The dies are simply rectangular pieces of hardened steel suitably formed to pinch the wire and fastened in steel die-holders by clamp screws. The dies project from the holders and are made to a standard length, so that it is necessary to change the dies for different diameters of wire. The die-holders are made with four bumpers extending from the face to prevent the dies from chipping when the moving die is in its forward position. The moving die-holder has two guide pins that are aligned with corresponding holes in the stationary die-holder in order to facilitate matching the dies when setting up.

The machine requires a 2-hp. motor and operates at from 100 to 160 strokes per minute, depending on the size of the point. The machine complete weighs 1,375 pounds.



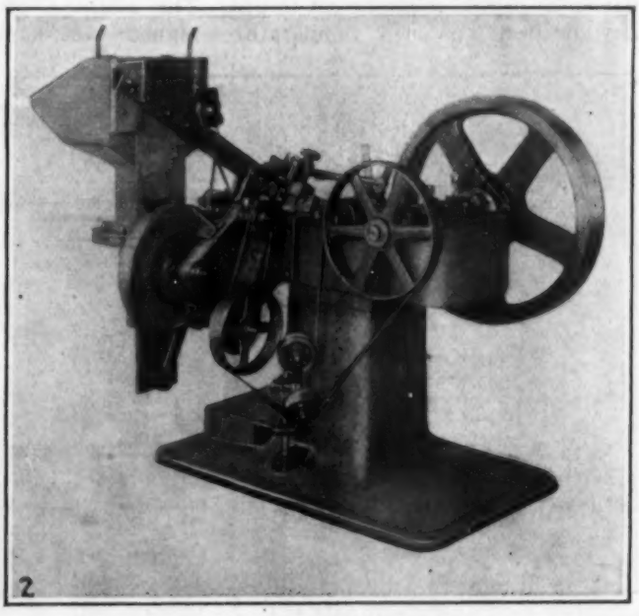


Fig. 1—Waterbury Farrel Pinch Pointing Machine. Fig. 2—Rear view of machine

Societé Genevoise No. 6 Thread-Cutting Lathe

An additional size of the Societé Genevoise thread-cutting lathe, designated No. 6 and larger than the former models, has recently been placed on the market in this country by the R. Y. Ferner Co., Investment Bldg., Washington, D. C. This lathe is adapted for the cutting of precision lead screws for machine tools and other machines.

The machine has a maximum distance between centers of 43 in. and the height of the centers is 6 in. The lead screw of the lathe has five threads per in., and sufficient change gears are provided to produce 36 pitches in inch units, ranging from 100 to 4.5 threads per in., as well as 20 metric pitches varying from 0.25 to 5 mm. An accuracy of $\pm$ 0.0002 in. in the threaded length of the lead screws produced is guaranteed.

An important feature of the machine is the mechanism for the automatic correction of the lead screw errors and for temperature. The device by which the correction is applied is shown in the rear view of the lathe, Fig. 2, and consists of a long curved slot through which a pin on an extension of the nut passes. As the carriage advances, the pin follows the contour of the slot and advances or retards the movement of the carriage slightly to correct for the observed errors of the machine lead screw.

The framework of the corrector bar is pivoted at the left-hand end and carries at the other end a graduation by which it can be set to give any desired standard temperature for the construction of a screw on the machine. The tilting of the framework gives a uniform increment or decrement to the movement of the carriage as it passes along. Six working speeds are available, ranging from 12 to 50 r.p.m., and the return speeds are four times as great.

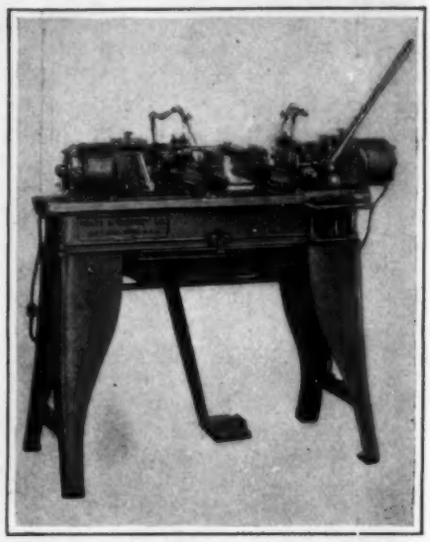
The longitudinal slide has a holder in which a comparator tube for checking work in progress can be mounted. Internal and external threading may be done, and the tool slide arrangement permits the withdrawal of the tool in either direction without changing the adjustment of the tool holder. The two slides have graduated heads, and a graduated circle for setting the tool holder is provided. The tailstock has a transverse adjustment.

The auxiliary equipment includes a driving plate for external work, a 9½-in. faceplate, a steady rest, centers and cutting tools. The total length of the machine is 76 in. and the net weight is 900 pounds.

Pratt & Whitney Improved Duplex Hand Centering Machine

The Pratt & Whitney Co., Hartford, Conn., is now marketing an improved design of its duplex hand centering machine, the former model of which was described on page 709, Vol. 57, of the *American Machinist*. The addition of an entirely redesigned work-handling device, operated by means of a treadle instead of by hand has increased the possibilities of the machine and speeded up the entire action.

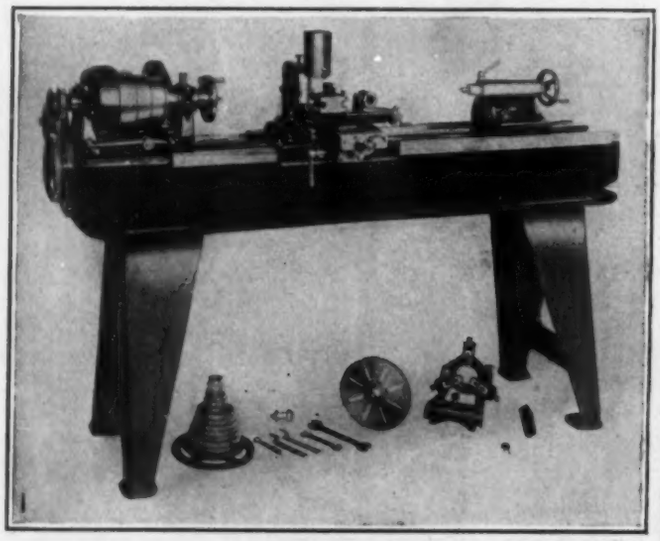
The use of the treadle leaves one of the operator's hands free to handle the drills while the other is used to



Pratt & Whitney Improved Duplex Hand Centering Machine

load and unload the work. The work-holding device consists of two work-slides that carry an adjustable V-block and a movable jaw. The jaw is moved by means of the treadle so that the work is securely clamped between the flat surface of the jaw and the groove of the V-block. Each work-slide has a micrometer dial at the front, one turn of the dial moving the V-block sufficiently to accommodate a change of $\frac{1}{8}$ in. in the diameter of the work.

A compensating device on the slide provides for a variation of $\frac{1}{16}$ in.



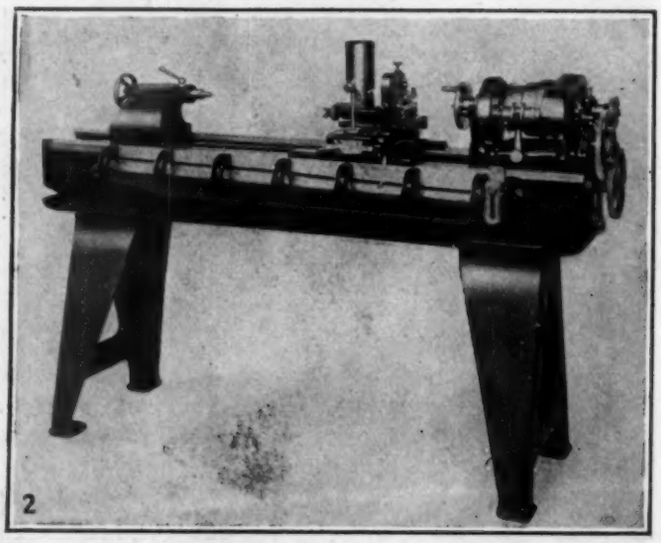


Fig. 1—Societé Genevoise No. 6 Thread-Cutting Lathe. Fig. 2—Rear view of machine

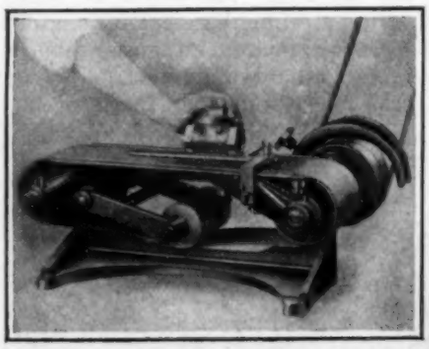
either way from the nominal diameter of the work being centered. With these arrangements the machine will handle work from ¼ to 1½ in. in diameter. A spring plunger returns the work-slide to its starting position when the pressure on the treadle is released. The work is loaded into the machine by hand and held in place by means of the treadle.

The same bed and type of head that was used on the former model is used in this machine. The drilling head is driven by a ¼-hp. motor through a two-speed gear box and uses regular centering drills. Other types of drills can also be used if it is desired to use the machine for special purposes. Two heads are mounted on the machine, each with its individual motor and gear box. A single lever feeds both drills simultaneously. Stops are provided so that the machine may be set to make the same size of hole in either end of the work or to complete the work with an exact length between holes.

The machine will accommodate work from 2½ in. to 18 in. in length, and occupies a floor space 54x30 inches.

Coats No. 2 Abrasive Band Grinder

The Coats Machine Tool Co., Inc., 110 West 40th St., New York, N. Y., has recently brought out an additional size of its bench-type abrasive band grinder. The machine is



Coats No. 2 Abrasive Band Grinder

furnished with an adjustable backstop and is used for producing a straight-grain finish on metal and bakelite parts, as well as for finishing wooden patterns.

The abrasive band on the machine is 6¼ in. wide and 59 in. long, being kept at the proper tension by an idler pulley. The table is 8 in. wide and 20 in. long. The band is driven by a 6-in. pulley that should run at from 300 to 500 r.p.m. The weight of the machine is 150 pounds.

Foote-Burt High-Duty Drilling Machines

A recent addition to the line of drilling machines manufactured by the Foote-Burt Co., Cleveland, Ohio, includes two high-duty drilling machines, designated No. 23 and No. 24. These machines have sufficient capacity for drilling 1¼- and 2-in. holes, respectively, in solid steel, and are built in manufacturing and gear-box types. The manufacturing type is recommended for use in a single operation when the quantity is large,

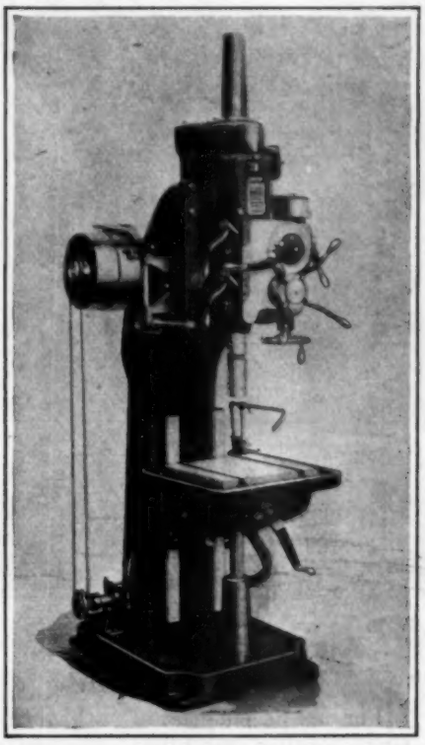


Fig. 1—Foote-Burt Gear-Box Type Drilling Machine

this type of machine being arranged for one speed and one feed.

The manufacturing type is illustrated in Fig. 2 and the gear-box type in Fig. 1. The latter is furnished for miscellaneous work where different sizes of drills are used. Feed and speed changes are obtained through sliding gears, the gears being operated by means of levers at the front of the machine. The gears can be meshed without stopping the machine. Three feeds, ranging from 0.006 to 0.026 in. per revolution, are available, together with nine speeds in a range from 75 to 610 revolutions per minute.

The power feed has an adjustable automatic disk stop. Double racks transmit the feed to the spindle sleeve. Hand feed is obtained through worm gearing, and quick traverse for the spindle is actuated by means of a handwheel located at the front of the machine.

The head is of the unit type and contains the complete driving and feeding mechanism. It can be readily removed from the upright without disturbing the rest of the machine. The upper end of the upright has a U-section, the head being mounted in this section. A single pump system supplies oil for the entire head unit. The spindle and the slow-running shafts are bronze-bushed, all others being equipped with ball or roller bearings.

The machines illustrated are equipped for belt driving, but a direct-connected motor drive can be furnished. The table can be either a plain or compound style, the plain table being of the knee type, gibbed

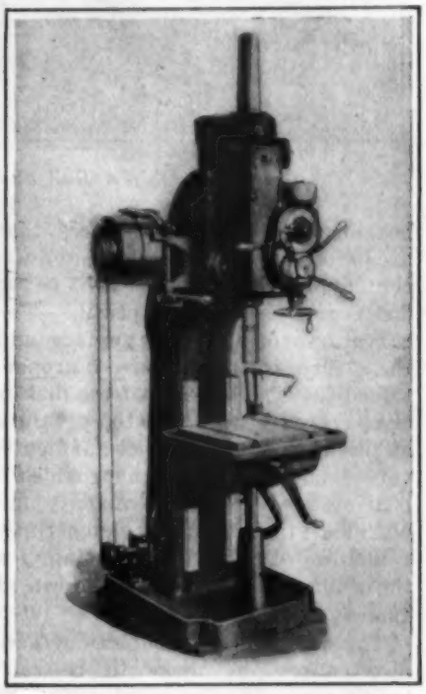


Fig. 2—Foote-Burt Manufacturing Type Drilling Machine

to a square bearing surface on the upright and supported by a telescopic jackscrew. The handwheels for controlling the adjustments of the compound table are conveniently located at the front of the machine.

The oil tank is cast in the base of the machine, the base being made in the form of an oil pan to catch all drippings. The gear-box type of the No. 23 machine weighs about 1,875 lb.; the manufacturing type weighing 1,750 pounds.

N K A Disk and Ball Bearings

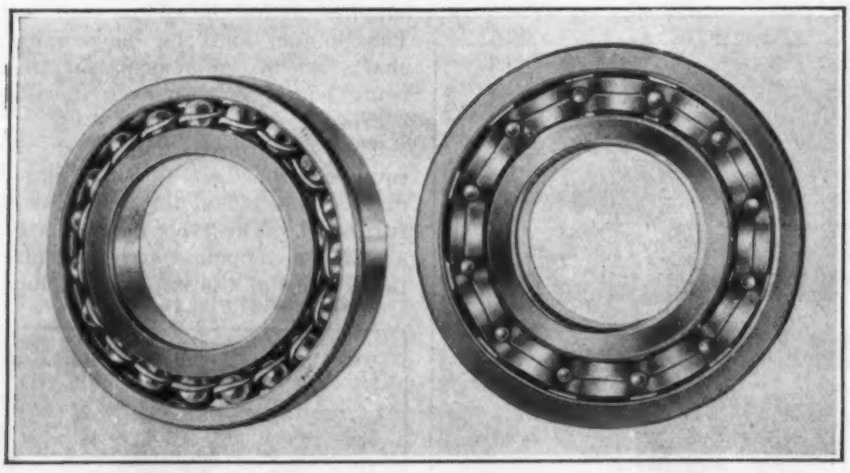
The Wollmar Engineering Corp., 224 East 42nd St., New York, N. Y., has recently placed on the market in this country the line of disk and ball bearings designated N K A and made in Gothenburg, Sweden. These bearings are shown in the accompanying illustration, the disk type appearing at the right and the ball bearing being shown at the left.

The rolling disks in the disk-type bearing have contact surfaces that are elliptical in cross-section, and the contour of the races in which the disks run is also elliptical. The curvatures of the disk surface and the surface of the race are so proportioned that the bearing of the disk is comparatively wide, but the pressure at the edge of the contact surface is very small. This design provides a bearing with high load capacity and obviates the tendency sometimes found in ordinary roller bearings for the rolling surface to break down at the edges.

The design of the contact surfaces also causes the disks to be self-guiding, as a friction couple is formed if the disk tends to leave its path and this couple tends to turn the disk back into its proper position again. This frictional or static guidance is aided in operation by the fact that the disk tends to rotate about its normal axis as it revolves in the bearing. These static and dynamic balancing effects make it unnecessary for the cage to guide the rollers and it serves only to keep them apart. These bearings are made in a variety of standard sizes and are said to have exceptional load-carraying capacities.

The ball bearing is of conventional design with the exception of the ball separator. This separator is made of high-grade steel wire, with a loop of wire between each pair of balls. The separator takes up little space in the bearing, allows a free circulation of the oil about the balls and the races, and is light and flexible. The ball races are comparatively deep to give high load capacity.

In addition to the radial type of ball bearing illustrated, a variety of thrust types are also made. It is said that the disk bearing will accommodate a combined radial and thrust load in about the same manner as a ball bearing, but that it has greater thrust capacity.



NKA Ball and Disk Bearings

Ajax Hot-Sawing and Burring Machine

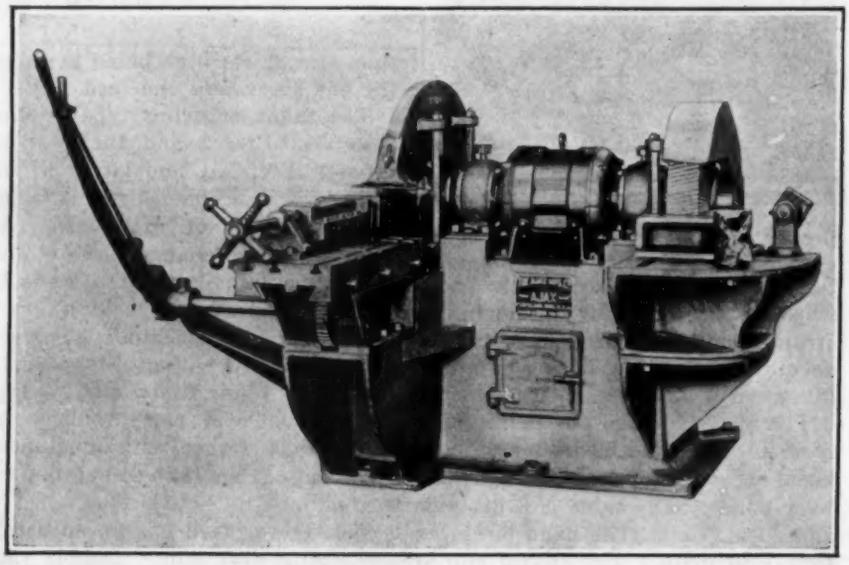
For use in connection with upsetting forging machines, the Ajax Manufacturing Co., Cleveland, Ohio, is marketing a motor-driven hot-sawing and burring machine. The machine has been designed primarily for the manufacture of jaw- and T-forgings in which the ends of the bar are split to facilitate the upsetting operation. The machine can also be used to advantage for cutting bar stock to the proper length for forging and for sawing a forging from a bar at the same heat at which it is forged.

The burring wheel is used for hot-milling flashes or burrs from forgings at the same heat at which the forging is made. It can also be used for milling the fins from butt welds.

The base is a single casting, to which the spindle bearings are secured. At the saw end a work table slides on ways and is operated by hand through a lever, rack and pinion. The table is arranged to accommodate devices to hold the work for cross-sawing and for longitudinal slitting.

The machine is built in three sizes, the smallest having a 14-in. saw and burring head and the largest a 39-in. saw with a 24-in. burring head. The three machines require motors of 7½-, 10-, and 15-hp. capacity, respectively. The motor is furnished for 60-cycle alternating current or for direct current, as required, the machine being operated at a speed of 1,800 r.p.m. in either case.

A Westinghouse motor is employed, the armature of the motor being mounted directly on the spindle of the machine. The stator is located on the machine base casting and has inclosing guards on either side to protect the windings from flying scale, dust and other forms of dirt.



Ajax Hot-Sawing and Burring Machine

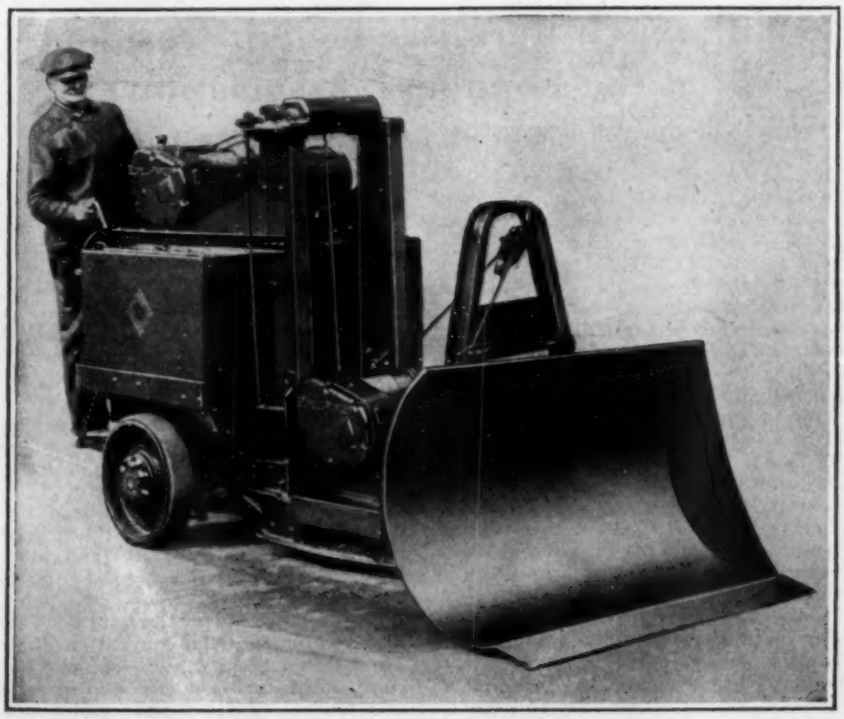
Elwell-Parker Elevating and Stacking Tructor

For transporting and stacking bulky cylindrical and rectangular packages, the Elwell-Parker Electric Co., Cleveland, Ohio, is now marketing an electric elevator tructor. The machine will handle rolls of various kinds of merchandise such as textiles and paper, as well as barrels, bales and boxes of various sizes and shapes.

The unit consists of an elevator tructor with a revolving apron or cradle for securing the load at the end of the platform, the cradle being built to suit the load that is to be handled. The load is raised or lowered by operating the elevating platform, and the cradle can be revolved to any position from the horizontal to the vertical by means of an additional hoisting unit.

The elevator raises the lower end of the load to a height of 6 ft., so that material 6 ft. high can be stacked end on end. The two hoisting units are standardized with interchangeable parts. All power for the equipment is supplied from one central storage battery carried in the battery compartment. Individual controllers for the lifting, revolving, and driving mechanisms are provided.

Dual compensating wheels are used at the end of the machine nearest the load and afford a wide tread, improved stability and large bearings in the wheels. Standard safety devices are installed. The slacking of the cable in case the descending load strikes an obstruction, will cause the elevating motor to stop. The equipment can be operated by one man.

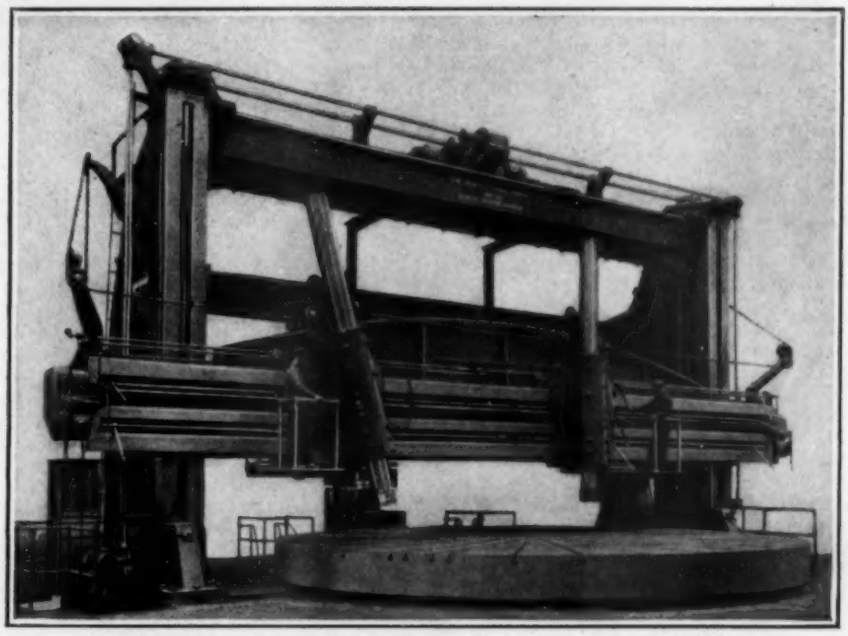


Elwell-Parker Elevating and Stacking Tructor

Bertram 36-Ft. Boring Mill

A boring mill of exceptional size has recently been built by the John Bertram & Sons Co., Dundas, Canada, and installed in the plant of the Canadian Westinghouse Co. for handling the large parts of electric generators. The mill has a swing of 36 ft. 2 in. and will take work 12 ft. in height. The boring bars have a vertical travel of 8 ft. and the table is 28 ft. in diameter.

The machine is of massive design throughout. The crossrail casting and the casting for the top bridge are 47 ft. long and 4 ft. deep. The uprights are 23 ft. 3 in. in height and 10 ft. 2 in. in length. The base of each upright is 30 in. wide and the face is 24 in. wide. The housings are bolted to the bed at the bottom and connected at the top by a cross girder. Additional stiffness and support are given by a built-up structural steel girder that extends between the backs of the housings.



Bertram 36-Ft. Boring Mill

The table is massive in construction and has four sets of T-slots. It is driven by a large spur ring gear. A 60-hp., variable-speed, d.c. motor mounted at the rear of the machine furnishes the power for driving. It drives through two sets of back gears that are completely enclosed.

Push-button stations for starting and stopping the machine are located on each saddle and on each side of the mill. All gears are cut from steel forgings or castings and all bearings are bronze-bushed. A small motor-driven oil pump provides forced lubrication for the table track and the spindle. The drive gears run in an oil bath and all bearings in the drive are lubricated from a central reservoir.

The total weight of the machine is 700,000 lb. and the table alone, with its gear and spindle, weighs 208,000 pounds.

News of the Week

Many Questions Discussed at Joint Automotive Meeting in Cleveland

Maintenance and service problems are the topics of experts

A joint service meeting of the National Automobile Chamber of Commerce and the Society of Automotive Engineers was held in Cleveland Nov. 18-19. Alvan Macauley, president of the Packard Motor Car Co. presided the first day. Mr. Macauley in his opening remarks traced the rise of service and maintenance and pointed out, that whereas formerly this used to be the poor sister in the industry it is now becoming one of its most profitable branches.

The value of standardization was emphasized by A. M. Dudley, manager of the Automotive Engineering Department of the Westinghouse Electric & Manufacturing Co. and the services of generators and starting motors and logical progression was described by which all automotive needs could be met.

A brief talk was given by H. L. Horning, president-elect of the Society of Automotive Engineers, in which he said that psychology entered largely into maintenance matters.

Many of the papers dealt with purely automotive matters, but one by H. N. Davock, service manager of the Packard Motor Car Co. is worthy of note. This dealt with the merchandising of service where business should be definitely gone after and profitable prices obtained. Parts entering into the repairs should have such prices put on them that would be sufficiently low to attract the customer to the original manufacturer and keep him from going elsewhere, and yet at the same time, high enough to bring in their own share of the profits.

Standardizing the Repair Shop

Mr. Davock brought out the benefit of analyzing repair shop expenses and making this public to the dealer concerned, so that each dealer is pitted against the others. All this tends toward the standardization of repair shop costs and to the establishment of what are called flat rate schedule times.

Another paper which is of interest was that by John Younger, Associate Editor of the *American Machinist*, dealing with the "Training of Mechanics." Mr. Younger said: "There are many courses both in schools and universities for the training of the engineer and executive—there are courses for the plumber, bricklayer, plasterer, etc., in many technical high schools, but except for some individual cases, there is little being done in training skilled repair shop mechanics. The exceptions are the spendid work being done by the Y.M.C.A. and K. of C. schools in teaching the fundamentals of the craft. A few high schools are entering on this work, but there is a lack of co-operation between the industry and the educational people.

"This want of properly trained mechanics is being seriously felt at present in maintenance work. There has been a great deal of attention paid to the factory mechanic, who is provided with blue prints, jigs, tools and fixtures and competent foremen, all to educate him in the proper way to go about his business. The repair shop mechanic works with parts dirty from long use; he works by himself—he has no blue prints to guide him—he has only as a rule his own limited personal experience to draw on. True, this is being remedied by many companies, by issuing operation and routing sheets covering instructions in detail as to how to disassemble and reassemble units for repair, but there is still a tremendous work to be done in educating the mechanic along fundamental lines of proper repairing."

J. C. Wright, director of the Federal Board for Vocational Education made a survey of repair shop mechanics in the city of Columbus, Ohio, and out of 100 men interviewed, only twenty-two per cent had received any training and 83 per cent had finished school at the eighth grade This means that 78 per cent acquired their training by their absorptive powers and picked up their trade in their own comparatively unintelligent manner. Mr. Wright is cooperating with Fred C. Smith, director of the Technical Department of the Y.M.C.A., in standardizing the 55 automobile schools of the association, that are now training 13,000 students each year.

The article on the training of mechanics of the Buick Motor Car Co. repair shops as given in the *American Machinist* (vol. 61, No. 11) was quoted from. The article points out how the Buick Co. has a school at Flint and how it supplements the work of the school by training men at its various distributors' and dealers' stations and how it keeps in touch with the men throughout the year by "service clinics." The work of the Brown-Lipe Gear Co. and the Timken Detroit Axle Co. in establishing schools for training men along those lines was also mentioned. Each company, of course, specializes along its own particular line of work, it was stated.

William H. Barr Re-elected President of the Founders' Association

Pass resolution against proposed child labor amendment

William H. Barr was re-elected president of the National Founders' Association at the annual meeting held at the Hotel Astor, New York City, Nov. 19 and 20. Mr. Barr is president of the Lumen Bearing Co., Buffalo, and has been an active worker in the metal working industry for many years. He has been at the head of many important movements in this country and is generally conceded to be an industrialist of the first rank.

F. B. McBrier of the Erie Steam Shovel Co., Erie, Pa., was elected vice-president succeeding Charles L. Taylor of the Taylor & Fenn Co., Hartford, Conn. A. E. McClintock was elected commissioner, J. M. Taylor, secretary, and the Chicago Trust Co., Chicago, remains the treasury.

Besides hearing many exceptionally illuminating speeches touching on problems of industry from various angles, the association adopted a resolution directed against the proposed amendment to the Constitution of the United States empowering Congress to prohibit or regulate the labor of all persons under the age of 18 years, the association pledging its opposition to it.

This year's registration numbered 229 persons from all parts of the country with most of the prominent foundries, steel plants and machine tool plants represented. Among the speakers were: James A. Emery, counsel for the association, Jacob Rubin of Milwaukee; J. M. Larkin, assistant to the president of the Bethlehem Steel Co., Bethlehem, Pa.; Col. Alfred P. Thom, general counsel for the Association of Railway Executives, Washington, D. C.; E. T. Runge of the E. T. Runge Cost Co., Cleveland, Ohio; L. A. Hartley, supervisor of trade and industrial education for the state of Nebraska; and the officers.

An alumni dinner was held on Tuesday evening and the convention dinner was held on Wednesday evening. Both of these affairs were very well attended and several speakers were called upon for remarks during the course of the evening.

Dr. Klein's Report Is Made Public

The Department of Commerce has made public the annual report of Dr. Julius Klein, Director of the Bureau of Foreign and Domestic Commerce. In a letter to Secretary Hoover summarizing the work of the bureau for the year ending June 30, 1924, Dr. Klein pointed out that the work of the Bureau has doubled in the last two years and during the year just ended the number of instances in which it has aided American business men have totaled nearly 1,250,000, with an average of more than 5,000 inquiries a day at the close of the fiscal year. On the basis of an investigation involving 3,675 inquiries addressed by business firms to the Bureau it was found that the resulting business amounted to about $427 per inquiry. This would indicate several hundred millions in foreign trade secured for the United States as the result of answers to inquiries handled by the bureau during the year. In certain respects the bureau's services to the American business community have increased as much as tenfold since 1922.

The vital value of the bureau to all Americans concerned with world trade was signally illustrated during this past year by its informational and promotive efforts following the great earthquake disaster in Japan. Though the office in Tokyo was destroyed and its established routine shattered, the work was immediately resumed and vigorously pushed forward.

The increase in the number of inquiries received from the various industries in this country is held by Dr. Klein to be ample demonstration of the effectiveness of the bureau, and particular stress is laid upon the export trade services rendered by the Foodstuffs Division to the various branches of agriculture that raise crops for export. Over 143,000 inquiries on foreign market problems were received by this one division from farmers, co-operatives and dealers in farm products during the last fiscal year, as compared with less than 29,000 requests for information recorded for 1921-22. Following the Foodstuffs Division in 1924 comes the Automotive Division with 106,000 inquiries, the Specialties Division with 98,000, and the Textile Division with 81,000. A marked and highly satisfactory increase in the number of inquiries received from small firms is noted.

Engineers Will Honor Carnot

Leading men of science will gather at the Engineering Societies Building, Thursday evening, Dec. 4, it is announced, to honor Carnot. The event, under the auspices of the Engineering Foundation, will celebrate "the centenary of the announcement in 1824 by Nicholas Leonard Sadi Carnot of the second law of thermodynamics and the Carnot cycle."

Prof. William F. Durand of Leland Stanford University, president of the American Society of Mechanical Engineers, will preside. Speakers will include Dr. William LeRoy Emmet, consulting engineer of the General Electric Co., and Dr. Michael I. Pupin, professor of electromechanics in Columbia University.

Representatives of the French Ministry of Public Instruction and of French societies will attend. A message will be read from L'Ecole Polytechnique, where Carnot studied.

Co-operating with the Foundation are Columbia University, New York University, Stevens Institute of Technology, College of the City of New York, Polytechnic Institute of Brooklyn, Pratt Institute, and Cooper Union.

Railroads Plan Large Expenditures

Seven planks in the legislative and economic platform of the first-class railroads were drafted at an all-day session of the Association of Railway Executives in annual meeting at the Yale Club Nov. 19. Estimates by the executives indicated that during 1925 the railroads would expend approximately $1,100,000,000 for new equipment and improvements in addition to the $2,136,446,426 authorized during the last two years.

Several hundred executives, including practically every important railroad official in the country attended the meeting, which expressed itself as satisfied with the political and the business outlook for the coming year. This is the first large gathering of railroad officials since the election, which was accepted throughout the railroad community as a repudiation of the Government ownership idea.

The executives promised a campaign to improve the equipment and the service of the railroads on the same scale as in 1923 and 1924. They also directed attention to the expenditure of $1,077,297,000 for equipment and improvement in 1924, compared with $1,059,149,000 the previous year.

Estimates made were to the effect that judging from present conditions the railroads would spend even more in 1925 than they spent this year. Conservative estimates were that the total expenditure for the railroads during 1925 would exceed $1,100,000,000.

Hale Holden, president of the Chicago, Burlington & Quincy R.R., who has been chairman of the Executive Committee of the American Railway Association for the last two years, asked to be relieved of the duties. R. H. Aishton, president of the American Railway Association, was elected to succeed him. Mr. Holden will continue as a member of the committee.

Special Envelope for Air Mail

The Air Mail Extension Committee, New York City, has received the government approval of a special envelope designed to be used in sending air mail. The envelope has a red, white and blue stripe across the upper half of it and in the lower left hand corner is a stamp with the wording, "via air mail, envelopes of this design approved by the P.O.D. for exclusive use in air mail."

Progress Is Shown by Dr. Burgess Report

Scientific investigations and tests resulting in large savings to the Government and to American industry through improvement in processes and the fixing of uniform standards are featured in the annual report of Doctor George K. Burgess, Director of the Bureau of Standards, submitted to Secretary of Commerce Hoover.

An increase of more than one hundred and twenty-five times its initial volume has taken place in the testing work of the Bureau of Standards during the 23 years of its existence, the report states. During the year just closed 135,852 tests were conducted by all divisions of the Bureau, as compared with 115,729 in 1923.

Most of the tests of the past year were executed for other branches of the Government, practically every branch making use of the facilities provided. A great deal of testing, however, is done for commercial firms and for individuals, over 40,000 test folders, covering over 600,000 such tests, for which a charge is made, having been issued since the founding of the Bureau. The Government work is given precedence, however, and in some cases all testing except that for the Government has had to be refused because the demand exceeds the facilities for doing this work.

Power Show Plans Are Perfected

Industrial activity, which is expected to be on the increase during the coming year, will require more power, greater economy in the use of fuel and more efficient mechanical devices, according to the promoters of the Power Show that will be held Dec. 1 to 6 at the Grand Central Palace, New York City. The show, they state, furnishes a good opportunity for manufacturers and engineers to inspect the latest developments, compare the relative merits of competing articles and meet the representatives of their builders under favorable conditions. This show, which is the third in the series of the National Exposition of Power and Mechanical Engineering, will occupy over 150,000 sq.ft. on three floors, and about 400 exhibitors will be represented.

All types of apparatus for the combustion of fuel and the generation of power in central stations, in industrial plants and in large office and apartment buildings will be exhibited. In addition there will be feature exhibits of materials handling equipment, machine tools, refrigerating machinery and heating and ventilating apparatus. A large section of the exposition will be devoted to mechanical power transmission. The complete treatment of power and mechanical apparatus makes a strong appeal to the architect, the engineer and the manufacturer. Lectures and motion pictures will be featured at some of the sessions and it is expected will be the means of conveying a greater number of ideas than at previous power exhibitions.

French Industry Awaiting Developments

Many problems to be worked out when Dawes plan is inaugurated—New foreign trade policy may be evolved at Lyons meeting—The railroad situation

By Our Paris Correspondent

AGAIN French industry is marking time. The summer slow-down continues, aggravated at the moment by the new political situation in England resulting from the resignation of the Macdonald cabinet and the check of the latter's free trade policies, none the less than by the fear that the German revival after the full application of the Dawes plan will mean at least a metallurgical war in all the markets of the world. Incidentally the Franco-German trade agreement, outlined but not ratified as yet, is by no means meeting unqualified favor in France. It will take six month's operation at least to prove the worth of the plan or the lack of it.

France, by agreement with England, is furthermore to sur-tax all German imports 26 per cent (which had been abolished during the Ruhr occupation) which will be collected from the French purchaser as the goods arrive at the frontier, credited to reparations account and left to the German vendor to collect from his government if he can. Whether this will help or injure Franco-German trade is not quite clear. Opinion is divided. With a project so hazy that it looms first white and then black it seems strange that the Dawes plan did not provide for its abolishment entirely or hold it down to 5 per cent as proposed by England.

Already the *Syndicat des Fondeurs de France* has protested against the French railways placing orders in Germany arguing that the new trade exchange scheme should apply to German dyestuffs and chemicals, just what those particular industries in France naturally do not want. Metallurgy in the widest sense of the application of the word being the stronger card it may win out since it is supported on this issue by the six leading firms manufacturing railway material.

Steel and Iron Prices

Steel and iron prices show little change in the last months, but non-ferrous metals are steadily rising in price, notably illuminum ingots at 1,015 francs the 100 kilos, as compared with 950 francs a month ago. Only lead and anti-friction metals appear to be stable. Zinc, nickel and copper are all on the rise. Railways are buying only a little machine or tool equipment, but are placing continual orders for current supplies of material and small equipment with outsiders. Stocks and bonds of metallurgical industries and the metal and machinery trades in general are of a satisfying stability, many indeed are rising in their bourse quotations, but the latter are to a great extent the smaller industrial units.

The financial problem just now leads all others. Dollar exchange only recently got dangerously near the twenty franc mark again, which not even the Morgan millions were able to prevent. The note issue of the Bank of France now exceeds forty billion francs, leaving a margin of but some four hundred millions to be issued in case of critical need. The budget needs of the French finance minister for 1925 show an excess of nearly three billion francs over possible receipts and above all commitments abroad during the next few months, for deliveries yet to be made and for the liquidating current accounts, are sufficiently great to cause some anxiety.

French railways have again borrowed in the United States to the extent of $95,000,000, all told for the four great trunk lines and there is absolutely no mention of any part of this sum being ear-marked for expenditure in America for either motive power, rolling stock, equipment or machinery. This policy is the direct opposite of that of the French when they loan money to the Argentine, Roumania or Austria — in the past as in the present, a method which Germany and England also know and practice to perfection.

Citröen's Plans

The annual automobile salon has just closed its doors. If any big business was done it was for export. Citröen announces a production of five hundred cars a day which in a year represents more than half of the present day total French registration, hence his market is obviously abroad, England, Belgium, Germany even, taking large numbers.

The Marquis de Dion of the De Dion-Bouton firm is concerned as to the future growth of the industry in France in that he claims that it occupies but a very small place in government projects and that little or nothing is being done to encourage it, indeed the continually increasing taxation of the motor car in France—higher than in any other country—is a continual handicap. Present registration, including all passenger vehicles, is but 290,928, an increase of 50,000 over the figures of the year before. The growth of the commercial vehicle has been proportionately greater, but one suspects that the saturation point is near, at least until prices come down, which will not be until production costs can be reduced.

During the first eight months of 1924 exports of engines, motors and boilers and accessory parts thereof increased over the year before by 18,000 tons, while tools and machinery fell off 2,000 tons, though the valuation increased 20,000,000 francs. This shows far more plainly the rise in prices than it suggests increasing or improved methods of marketing abroad. It is worth noting that of the first three items mentioned imports were practically stationary as compared with 1923, but with tools and machinery they increased 7,500 tons in volume and 28,000,000 francs in value. There is an apparent anomaly here, but at the same time it points to the constantly increasing prices of French machinery and tools in general. It is either that or the equally diminishing cost of the foreign product of a like nature. The point is one that may not be ignored and probably explains some of the difficulties surrounding French manufacturing problems today—an inability, or incapacity, to bring production costs down to compete with foreign output. The condition of affairs has been suspected for some time but the figures herewith, which are extracted from the official government statistics, confirm this beyond all doubt.

A convention of the French Foreign Trade Council is to be held in November at Lyons under the presidency of the Minister of Finance in an effort to weld the French manufacturing world together in a co-operative foreign trade campaign which will unquestionably prove the mettle of competitors, above all as a scheme is to be broached for the carrying of foreign accounts, the discounting of them if required and the insuring of their payment. This is nothing more than a revolution in foreign trade methods and may prove to be an unattackable factor except by the adoption of similar methods by other nations. It smacks of class favoritism, but, after all, if any such encouragement were justified it is with foreign trade.

A certain activity in interior retail trade is noticeable, but is seasonable more than it is a sudden spurt based on a revival of optimism. The railways still show largely increased receipts over the same periods in 1923—the percentages running from 13 per cent on the Nord to 20.8 per cent on the P.L.M., and 47.6 per cent for the Alsace-Lorraine system. Again, since fares in various classes were raised from 37 per cent to 47 per cent last spring and a general readjustment of freight rates took place at the same time, the increased percentages mentioned prove nothing except that operating expenses eat up the increased fares faster than they can be turned into reserve profits as is proved by the additional loans obtained in the United States. The fact that passengers and freight are covering increased mileage ought to indicate some general advance in the prosperity of the country if not actually an increase in railway dividends.

Weights and Measures Meeting

The annual meeting of the American Institute of Weights and Measures will be held at the Engineering Societies Building, 29 West 39th St., New York City, Thursday, Dec. 4, at 2:30 p.m.

The Business Barometer

This week's outlet in Commerce, Finance, Agriculture and Industry based on current developments

By Theodore H. Price
Editor, *Commerce and Finance, New York*

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"ON WITH the dance, let joy be unconfined," is an old and serviceable quotation that well expresses the feeling of Wall Street at present. The bull market is running its course. Many are confident that it will last until Christmas, others are positive that it will continue for a year after Christmas, while not a few predict that it will not end until the election of 1928 commences to cast its shadow across the path of business. If there are any bears they are inarticulate, while the multitudinous bulls are vigorously vocal in acclaiming the merits of the stocks they have recently acquired.

In the circumstances it is hardly necessary to repeat the many explanations offered for the sudden and widespread outbreak of optimism in this country. They have been widely published and are known of all men.

The assurance felt that there will be no political interference with business for four years and the belief that the railroads are on the way to consolidation into a few big systems form the major premise of the argument for higher prices. There are, however, some who include the probability of inflation among their reasons for expecting a further advance, but the talk of inflation seems a little far fetched. A way to prevent it will be found, for the experience of 1920 and 1921 is still so vividly remembered that its repetition will not be permitted.

As to railway consolidation, F. J. Lisman expresses the conservative view in saying that "The profits to be made out of the consolidation of the railroads is what most buyers of stock are thinking of. These profits will be realized in many cases, but the market is discounting now events which are still many years away. Consolidation of the railways of the United States into twenty systems, more or less, is coming sometime, possibly within ten years; but the number of obstacles necessary to overcome in order to accomplish this aim can only be realized by those who are grappling with the situation."

There remains the hoped for immunity from anti-capitalistic legislation. It is the back-log of the speculative fire that is now burning so brightly. Whether it will outlast the short session of the old Congress that will convene on the first of December next remains to be seen. If it does we may breathe freely until December, 1925, for President Coolidge has let it be known that he does not expect to call a special session of the new Congress to meet on the fourth of March, as many had feared that he might.

Meantime the speculative markets remind one of the Atlantic Ocean in a storm. The waves are running high. Every now and again they break and those on deck are in danger of being swept overboard.

Cotton surprised most of the traders by advancing slightly on a government crop estimate of 12,992,000 bales and ginning returns that were heavier than were expected.

Copper is again reactionary after having touched 14 cents. There has been a distinct improvement in iron and steel. Large sales of the former at a substantial advance are reported and some big orders for steel have been booked at higher prices. Thus far the railways have been the principal buyers for there is not as yet any revival in building activity. Perhaps it will come in the spring, but no indications of it are presently visible.

Some quickening of distributive trade in general merchandise is descernible, but merchants are still afraid of the high price level and the hand to mouth policy continues to be generally followed. The oil companies are prophesying an advance in petroleum and its products, and the automobile people announce that they will be ready to meet the increased demand that is certain to be felt next spring.

But it would be inaccurate to say that the improvement in business is commensurate with the advance in security prices. The Stock Exchange theory is that those who invest or speculate in securities are more far sighted than their commercial contemporaries and that the advance in shares and bonds anticipates an acceleration of trade later on.

Some of the precedents sustain this view, but there are exceptions to every rule and it is at least questionable whether a boom in business with prices at the present level is either possible or desirable. Those who got their business training before the world war will doubt it, but the younger men who were at school or college ten years ago may think otherwise. At a time when sentiment and enthusiasm are such important factors in shaping the course of the markets it may be unwise to forget that these younger men are now in the majority.

The money market is a shade firmer, but the change is almost imperceptible and the weekly statement of the Federal Reserve Banks shows a decline of only four tenths of one per cent in the reserve ratio which now stands at 76.8 per cent.

The news from abroad is in the main encouraging and New York is filled with the emissaries of those who represent the would-be borrowers of Europe. It is expected that a $50,000,000 loan to France will be offered shortly. That it will be heavily over subscribed seems certain and foreign exchange is accordingly tending upward.

What's Doing in Industry

Improvement of a definite nature has been recorded in the machinery and machine tool field with the promise of even better business after the first of the year. The improvement that has been reported in all parts of the country has been based upon necessities rather than upon any expansions of factories or replacements of obsolete machines. But the inquiries that are being received by dealers would indicate that after Jan. 1 the buying will be on a more generous basis than it has been since April of this year.

November has proved a better month than October or September, but little hope is held out for improvement during the month of December, except as compared with December of last year.

Railroads as well as some general industrials and automobile accessory makers were in the market for necessities. Lists, however, have been received by dealers in all parts of the country from every big user of machine tools.

In the Detroit district business has been noticeably better during the past month, although figures recently issued show October production to be less than that of September. On the present basis it is expected that the yearly automobile production will be about 3,650,000 passenger cars and trucks. This is approximately half a million cars less than the record output of 1923.

Wall Street continues to attract the investors' and speculators' dollars although some profit taking was noticeable last week. The volume of business has broken all records and favorites have advanced to new highs in many instances.

The Industrial Review

Progress of the machinery and machine-tool business in various parts of the country

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

Philadelphia

Approach of the end-of-the-year season, when manufacturers begin to retrench in preparation for inventories, has delayed the resumption of large scale business in machinery establishments of Philadelphia. Many of the larger manufacturers of machinery and machine tools, however, feel that after the first of the year there will be a substantial increase, which they have been anticipating for several months.

Machinery dealers generally express the belief that the post-election situation will create a feeling conducive to increased buying, although there is nothing now to indicate that this period has arrived. In other lines, however, including wholesale mercantile establishments, there has been a noticeable picking up of business.

In the interim between now and Jan. 1, machinery dealers expect a piece-to-piece policy to be in vogue among purchasers.

"We anticipate a very great improvement in the machine tool business in the near future, due to a greater feeling of confidence among all business men," was the comment of the head of one of the largest machine tool establishments in the Philadelphia district.

During October there was an increase in employment and in the wages of workmen throughout eastern Pennsylvania and southern New Jersey. Out of 652 establishments reporting, the increase in employment was 2.7 per cent. The improvement was pronounced in the textile industry. In this line per capita earnings increased in all of the industries, and employment was greater in all except one of this group.

Among the other industries showing improvement were automobiles, electrical machinery, foundries, petroleum, refining and leather tanning.

New England

Improvement is evident in the machinery and machine tool lines in New England. In Waterbury, Bristol and New Britain, employment offices report hiring additional help to meet heavier production requirements. The increases in employment have ranged from seven to nineteen per cent above what have been the normal working forces of the last fifteen months. While the working schedules are mostly 45-hours per week, others are following the 55-hour weekly schedule. Greater activity is reported in the foundry industries, also.

Machinery manufacturers are continuing operations in substantially the same volume as during the past six to eight weeks and the inquiries remain about the same. The reports from Hartford and New Britain indicated that in the last few days some of the promised post-election business had arrived. A few traces of better foreign business were reported. Italy has placed business in the New England territory.

Indications are for moderate improvement between now and Jan. 1 and for marked betterment after the new year has commenced.

Detroit

With an eye on 1925 rather than on the remaining weeks of this year, leaders in the machine tool and machinery field in Detroit feel confident that the strengthening generally in all lines of industrial activity during the past two weeks will result in larger orders with the beginning of the new year.

Disappointment has been expressed in some quarters at the delay in long-expected announcements of expansion programs on the part of the automobile factories in the Detroit area, as executives have been more reticent in definitely announcing future plans than had been expected by machine tool dealers.

The view is held in the most reliable quarters that during the last five or six weeks of this year a slow but material pick-up in the machinery field is inevitable. Many of the motor plants will probably close down some time during December for the yearly inventory, and this may effect sales somewhat. Because of the slump that the industry experienced in the summer it is quite probable that the shutdowns will not be so extended as during previous years.

The present demand in Detroit appears to be for die room and tool room equipment, as well as some maintenance equipment. Dealers always expect a larger volume of business in this particular field at this time of the year in Detroit.

Automobile production is gaining with each week, while the other industries dependent to a large extent upon the automomtive plants report a better outlook.

Cleveland

November has not brought anything of the startling or sensational into the machinery and machine tool market in the Cleveland district. A steady increase in demand in all branches of the industry has been noted in the last two or three weeks, however, and this is of more satisfaction to the leaders in the trade than any spurt would be.

To state that conditions are not spotty would be stretching the point of optimism. The situation as relates to the shear, punch and allied lines is significant in this respect. Through the month there has been no indication of steadiness in the outlet for this class of equipment. One week as one manufacturer points out, has been unusually good, to be followed by another week of unusual quiet. Moreover, industries that were expected to make a brave showing in placing new business have failed to respond, while in other quarters where little activity was looked for a considerable improvement has developed. This view is concurred in by others in this branch of the trade.

On the other hand there is one field that is showing unusual progress in the last week or so, and that is the planer division. Not only have inquiries increased during the period, and this for both heavy and light duty equipment, but they are for substanial numbers as compared with the previous light inquiry. Still more important is the actual placing of orders for this class of machine tools. An outstanding feature of this new business, one manufacturer points out, is that some of it has come from sources in both the East and South that had not been heard from by this plant for nearly two years.

As a barometer of general industrial improvement the change for the better in the last fortnight in the automatic field is significant. In nearly all instances where producers have been cultivating their fields for new business a considerable number of orders were booked conditionally. The provisions made for cancellation of these orders no longer existing, the business now is coming in. Some of this is going into new industrial plant work, but the majority is finding its way into established plants that are planning more or less extensive improvement, and in a few instances looking to expansion of their own production.

Cincinnati

There has been a substantial improvement in the tone of the Cincinnati machine tool market since the election. While only a few orders of any size have materialized to date, inquiries have been more brisk, production has taken a slight upward swing, and executives are inclined to be optimistic about the immediate future.

Operations of local plants are about on a par with the volume of production during October. Although a number of concerns are working on somewhat of a restricted schedule, others are more nearly normal than they have been for a long time. Executives are gratified that the last two months have witnessed a larger number of sales than at any previous time this year.

One of the interesting developments lately is in the export field. It is true that foreign countries are still buying frugally in the local machine tool mar-

ket, but total sales are on the increase. The trend of business is shown by the fact that in the last few days a South African railway placed an order for the latest type switch planer. Several Cincinnati concerns state that they look for foreign business on special machines rather than on standard machines.

The larger concerns here report that their operations have been displaying an improvement. Lathes and milling machines are being built in fair volume. Planer sales have been only fair, but an improvement is anticipated. Drilling machinery orders have increased slightly.

Sale of used machinery is about the same as it was last month. Conveying machinery concerns report good production at present. Orders that have been scheduled ahead call for continued production at the present scale during the next few months. Woodworking machinery houses report much the same story. They have been operating at capacity for a number of months and have business booked ahead to keep them running steadily for several months.

New York

Dealers in machinery and machine tools in the New York district are of the opinion that business from now to the first of the year will be good, but will be for necessities only. Inquiries already received by most of the dealers would indicate that when the new yearly appropriations have been made buying will be considerably better and expansions will be the order of the day. Meanwhile for the next five weeks business will be of a steady nature and of enough volume to keep the sales forces busy.

Railroads were in the market last week to a small extent and the Lackawanna, New Haven, Lehigh Valley and Pennsylvania all bought tools. Lists were received from several Southern roads and general industrials in the New Jersey districts during the week.

Automobile makers in the Eastern states were not in the market to any extent during the week, but accessory makers bought some of the smaller tools.

The used tool market was somewhat improved again this week and exporting reported a betterment with shipments being made to South American and European ports.

Promote World Standard for Bolts and Nuts

A first step which may eventually lead to the establishment of a world standard for bolts and nuts was taken at a conference in New York, Oct. 28. There were present at the conference, which was held under the auspices of the American Engineering Standards Committee, representatives of the German, Czechoslovakian and American national standardizing bodies.

It was unanimously agreed by all present that world-wide uniformity in wrench openings is so important that it would be desirable to discuss the matter in the near future in a general international conference.

Gain in Employment in October

Employment in manufacturing industries increased 1.7 per cent in October as compared with September. This is the third successive month showing a gain in employment, and marks a return of the regularly expected autumn increase in employment, which, however, failed to appear in 1923. Aggregate earnings of employees in October increased 3.7 per cent, and per capita earnings increased 2 per cent.

These unweighted figures, presented by the United States Department of Labor through the Bureau of Labor Statistics, are based on reports from 8,768 establishments in 52 industries, covering 2,616,622 employees whose total earnings during one week in October were $67,947,217. The same establishments in September reported 2,573,846 employees and total pay rolls of $65,496,560.

Seven of the nine Geographic Divisions of the United States show increases in employment in October, and eight of the nine show increases in pay-roll totals. The East South Central States led both in increased employment and in employees' earnings. The New England and Middle Atlantic States follow as to increased employment, and the East North Central and South Atlantic States as to increased pay-roll totals.

Niles-Bement-Pond Defers Preferred Dividend

The directors of the Niles-Bement-Pond Co., New York City, announced that there would be a suspension of the dividend on the preferred stock outstanding. In a statement it is explained that prospects for the year are good and that it was deemed better not to weaken finances by paying a preferred dividend out of surplus.

The Pratt & Whitney Co., a subsidiary of Niles-Bement-Pond Co., also deferred payment of the dividend on the preferred stock for the same reasons that the parent company gave of conserving funds at this time. The preferred stock of the Pratt & Whitney Co. is cumulative and dividends not paid now must eventually be paid before dividends can be resumed on the common stock.

Business Items

A consolidation of the Kilborn & Bishop Co., New Haven, Conn., and the Bay State Forge Co., Springfield, Mass., has been announced. The business henceforth will be conducted in New Haven under the name of the Kilborn & Bishop Co.

The Reeve-Fritts Co., machine tool dealer located at 37 S. Desplaines St., Chicago, will move in December to larger quarters at 558 W. Washington Boulevard.

The Carborundum Co. will move its Chicago headquarters from 558 W. Washington Boulevard to the Butler Brothers' Building in December.

Charles H. Besly & Co., Chicago, have been appointed distributors for the Cleveland Twist Drill Co., Cleveland, Ohio.

The Machinists' Supply Co., Chicago, has been named representative for the Detroit Twist Drill Co., Detroit.

The AC Spark Plug Co., Flint, Mich., has announced the purchase of a 23-acre factory site at the southeast corner of Davison and Western Roads on the Belt Line railroad, Flint. The company is about to undertake the manufacture of two new automotive equipment units. One of these will be an air cleaner, while the nature of the second, a devise to be used on gasoline engines, will be made public at a later date.

Obituaries

WILLIAM T. NASH, secretary and general manager of the Monarch Bumper Manufacturing Co., and treasurer of the Atlas Foundry Co., Detroit, Mich., died recently in that city.

EMORY E. ELLIS, president and general manager of the Union Tool Co., Orange, Mass., died in the Gardner Hospital, Gardner, Mass., Nov. 15, following an operation for appendicitis. He had been with the company for 25 years in different executive capacities and had numerous inventions to his credit. He removed with the company from Fitchburg to Orange about 15 years ago.

SAMUEL DOUBT, aged 78 years, died recently at his home in Aspinwall, Pa. He has long been connected with the Pittsburgh office of Manning, Maxwell & Moore.

FRANK H. CRAWFORD, aged 43 years, died recently at his home in New York City. He was a member of the firm of F. H. Crawford & Co., 299 Broadway, New York.

THOMAS W. SHERIFFS, secretary and treasurer of the Sheriffs Manufacturing Co., Milwaukee, manufacturer of propeller wheels and other metal marine supplies, died Nov. 17 at the age of 72 years. He had been ill ten days. Mr. Sheriffs was born in Milwaukee and was associated with the Sheriffs Mfg. Co., founded by his father, for nearly fifty years.

Personals

BENJAMIN P. LANE has been appointed manager of the Los Angeles, Calif., office of the Sullivan Machinery Co., Chicago. His headquarters will be at 412 E. Third St.

A. A. WESCOTT has resumed his duties with the Cyclops Steel Co., Titusville, Pa., and will be the representative in the New York State territory excluding the metropolitan district.

W. A. GOWING has been appointed representative for the state of Michigan and the city of Toledo by the Cyclops Steel Co., Titusville, Pa.

C. E. BILTON has been elected president and N. M. MARSILIUS vice-president and general manager of the Bilton Machine Tool Co., Bridgeport, Conn.

HANS RENOLD, manufacturer of driving chains, Manchester, Eng., is returning to England Nov. 29 after a six-weeks' business visit to the United States and Canada.

ALFRED G. NORRIS has been appointed manager of the New England office of the Strom Ball Bearing Manufacturing Co., Chicago, Ill. His headquarters will be at 75 Pearl St., Hartford, Conn.

W. F. ZIMMERMAN, chief engineer for Gould & Eberhardt, Newark, N. J., has been awarded the Edward Longstreth medal of the Franklin Institute for his invention of a worm gear hob and process.

C. A. ANDERSON has sold the San Diego Boiler Works at San Diego, Cal., to ALBERT SMITH.

A. W. WIESE, sales engineer of the Strom Ball Bearing Manufacturing Co., Chicago, has been transferred from the Philadelphia office to the New England office, Hartford, Conn.

Hoover Reviews Year's Business Progress

In a review of business conditions for the year ending June 30, 1924, made public at the Department of Commerce recently, Secretary Hoover said:

"The outstanding features of the fiscal year were: First, the advance in agricultural prices, which had hitherto lagged behind industry since the slump of 1920; second, the beginnings of sound policies in German reparations leading to a hopeful measure of economic recovery in Europe; and third, the complete recovery of our own industry and commerce (aside from agriculture), great stability of prices, high production, full employment, expanding foreign trade and prosperity throughout the business world. There were some moderate decreases in activity of some lines during the latter part of the fiscal year, but since its close there has again been general recovery in those lines."

The review, which will later be incorporated in the annual report of the Secretary of Commerce, is headed "Economic Progress." It covers industry, agriculture, transportation, banking and finance, the Dawes Plan, and foreign trade.

A table of "Major Economic Indexes," based on the calendar year 1919 as 100, shows that the general level of business activity was decidedly higher than even in that very prosperous year. The table indicates the following changes in the volume of business (quantities, not value) in the fiscal year 1924 as compared with the fiscal year 1923: The index of manufacturing production dropped slightly, being 115 in 1924 as compared with 116 in 1923. Mineral production rose from 11 in 1923 to 131 in 1924.

Westinghouse Reporting New Orders

Equipment orders aggregating $3,400,000 have been placed with the Westinghouse Electric & Manufacturing Co. The Illinois Central R.R. has contracted with the company for motor and control equipment to be used in connection with the electrification of the suburban service in Chicago which approximates $3,000,000. Orders for electric motor cars and trailers are expected to follow.

The W. S. Barstow Management Corp. of New York, has ordered a 15,000 kilowatt turbine and frequency changer for the Broad River Power Co. It will cost about $400,000 and it will be used at the new power station at Parr Shoals, near Spartanburg, S. C.

Baldwin Works Has Good Inquiries

The railroads of the country will soon again be bidding against one another for railroad equipment, in the opinion of Samuel Vauclain, president of the Baldwin Locomotive Works.

In a statement published in the financial district recently Mr. Vauclain said: "Inquiries are increasing and the outlook is more encouraging. We have four inquiries before us at present, which is the most we have had at one time for some months, and while the totals are not large it is a step in the right direction, indicating better business ahead. One inquiry is for eighteen engines, another for fifteen, another for ten and one for three."

Schenectady Works Increasing Forces

Signs of improved business conditions are seen in Schenectady in increased employment at the American Locomotive Co. and in the radio department of the General Electric Co. The locomotive works has increased its personnel from 2,647 to 3,287, with the probability of further increases to meet the demands of new orders.

At the General Electric Co., where a layoff has been general despite the company's plan to manufacture goods for stock, at least 200 employees have been added to the radio department to meet the seasonal demand for radio sets.

New York Steel Treaters Hear Bain

The regular monthly meeting of the New York chapter of the American Society for Steel Treating was held Nov. 19 in the assembly room of the Merchants' Association of New York Woolworth Building. Following the usual dinner held in the Post-Keller Restaurant in the basement of the building, the meeting was called to order and those in attendance heard Edgar C. Bain of the Union Carbide & Carbon Research Laboratories, Inc. speak. He took as his subject, "Some Fundamental Characteristics of High Speed Steel."

Western Road Will Buy Equipment

The Missouri Pacific Railroad Co. has applied to the Interstate Commerce Commission for authority to purchase under equipment lease $5,212,900 worth of new equipment as follows: 25 freight locomotives; 10 passenger locomotives; 15 switch locomotives; 1,000 freight cars for automobiles; 75 caboose cars; 2 dining cars; 2 parlor cars; and 2 steam-wrecking derricks.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Ball bearings, spark plugs, tire valves, and other automotive accessories. Soerabaya, Java. Agency. Reference No. 12,303.

Marine engines, supplies and accessories. Vancouver, Canada. Agency. Reference No. 12,222.

Diesel and semi-diesel marine engines. Dargaville, New Zealand. Purchase. Reference No. 12,214.

Steam engines, five, ten and fifteen hp. Bombay, India. Agency. Reference No. 12,216.

Electric grinders, hand and lathe. Dargaville, New Zealand. Purchase. Reference No. 12,214.

Conveying machinery and machine tools. Breslau, Germany. Agency. Reference No. 12,211.

Industrial machinery. Berlin, Germany. Purchase and agency. Reference No. 12,271.

Metal working machinery. Prague, Czechoslovakia. Agency. Reference No. 12,224.

Catalogs Wanted

Catalogs of all kinds of machine tools are requested by the Sociedad Jalisciense Impulsora de Industrias y Inventos, Guadalajara, Jal. Mexico.

Forthcoming Meetings

American Society of Mechanical Engineers. Forty-fifth annual meeting. New York City. Dec. 1 to 4. Calvin Rice, secretary, 29 West 39th St., New York City.

National Exposition of Power and Mechanical Engineering. Grand Central Palace, New York City, Dec. 1 to 4. Charles F. Roth, 1102 Grand Central Palace Building, New York City.

Exposition of Invention. Engineering Societies Building, 29 West 39th St., New York City. Dec. 8 to 13 inc., General offices, 47 West 34th St., New York City.

American Association for the Advancement of Science. Meeting at Washington, D. C., Dec. 29, Jan. 1, 2 and 3. Burton Livingston, Smithsonian Institute, Washington, D. C.

American Society for Steel Treating. Winter Sectional Meeting under the auspices of the Cincinnati chapter. Thursday and Friday, Jan. 15 and 16, in Cincinnati.

Society of Automotive Engineers. Annual Meeting. Detroit, Mich., Jan. 20, 21, 22 and 23. C. F. Clarkson, 29 W. 39th St., New York City.

American Society for Testing Materials. Twenty-eighth annual meeting. Chalfonte-Haddon Hall Hotel, Atlantic City, N. J., June 22, 23, 24, 25 and 26. C. L. Warwick, secretary-treasurer, 1315 Spruce St., Philadelphia, Pa.

Machine Requirements and Industrial Construction

Machine Tools and Equipment Wanted

Conn. Southport—C. O. Jelliff Mfg. Corp. —2 rolls, 48 to 54 in. face and 16 to 20 in. diameter.

Md., Baltimore—Baltimore & Ohio R.R., Baltimore and Charles Sts., W. S. Galloway, Purch. Agt.—12½ ton overhead traveling crane for Staten Island.

Mass., Allston (Boston P. O.)—Arcand Spring Co., 229 Brighton Ave.—additional machinery and tools for auto repair dept.

Mass., Arlington — E. N. Adams, 86 Everett St.—complete equipment for public service garage.

Mass., Boston—N. Cavalieri, 4 Curtis St. —miscellaneous tools and equipment for repair and service garage.

Mass., Boston—L. Danielli, 54-56 Newman St.—miscellaneous tools and equipment for public garage.

Mass., Boston—S. Shoolman, 43 Tremont St., Room 1114—equipment and tools for garage and repair shop.

Mass., Boston—Union Spinning & Plating Co., 67 Sundbury St.—18 in. swing lathe, ball bearing.

Mass., Dorchester (Boston P. O.)—W. Katzeff, 23 Ormand St.—equipment and tools for service garage.

Mass., Dorchester (Boston P. O.)—G. Ross, 418 LaGrange St.—additional tools and machinery for automobile repair shop.

Mass., Dorchester (Boston P. O.)—J. Varnerin, 85 East Cottage St.—equipment for garage service.

Mass., Roxbury (Boston P. O.)—N. Soloman, 40 Brinton St.—general equipment for repair and service garage.

Mass., Swampscott—McDonald Construction Co.—upright gear press, Weaver or equivalent for pressing gears.

Mass., Worcester—Sarkin Malhasion, 41 Forbes St.—miscellaneous tools and equipment for repair and service garage.

Mich., Bessemer—Bessemer Auto Service Co., L. R. Bissel, Purch. Agt.—garage equipment including tool lathe, drill press, air compressor.

Minn., Duluth—Acme Match Corp., Lyceum Bldg.—machinery for the manufacture of matches.

N. C., Statesville — J. C. Steele & Sons (manufacturers brick and clay manufacturing machinery), C. M. Steele, Purch. Agt.—locomotive crane, maximum capacity 8 to 10 tons, on 12 ft. radius, gasoline driven preferred, railroad car wheels (used); traveling head shaper, 24 to 30 in. stroke, single head (new or used).

O., Columbus — Vogel Coal Co., 1120 West Town St., W. L. Hall, Pres.—heavy loading and unloading unit, probably conveyor for use at new retail yard, Thomas St. and Dana Ave.

Okla., Oklahoma City—Hughes Tool Co., 300 Hughes St., Houston, Tex. — several new machines for machine shop.

Pa., Philadelphia — Pennsylvania Railroad Co., Broad St. Station, S. Porcher, Gen. Purch. Agt.—1 alligator shear.

Wash., Tacoma — St. Paul & Tacoma Lumber Co.—two 20-ton electric cranes.

W. Va., Huntington—A. C. Love Co., A. C. Love, Purch. Agt.—screw cutting engine lathe, about 60 in. swing and 12 to 14 ft. between centers.

Wis., Manitowoc—Aluminum Goods Mfg. Co., 15th and Franklin Sts., G. Vits, Pres. —special machinery to manufacture aluminum kitchen utensils, etc.

Wis., Milwaukee—Benesch Bros., Port Washington Ave., I. Benesch, Purch. Agt.— one power shear to cut up scrap iron.

Wis. Milwaukee—B. Hoffmann Mfg. Co., 1809 St. Paul Ave., manufacturers of valves and iron pipe — pipe cutting machinery.

N. S., Sydney—Prospectors Ltd.—complete equipment for saw mill.

Ont., Chepstow—J. J. Donnelly, Walkerton, plans the construction of a saw mill. Estimated cost $35,000.

Ont., Elora — W. McConnell — miscellaneous tools and equipment for garage and repair shop.

Ont., Port Elgin—Stevens Hepner Co.— equipment for the manufacture of brushes and brooms.

Ont., Toronto—Bd. Education, 155 College St. — equipment including motors, lathes, drills, shapers, saws, benches, carpentry and machine tools, etc., for proposed technical school.

Ont., Toronto—Booke Mfg. Co., Dartnell Ave.—tennon machines, saws, planers, mortisers, stickers, sanders, kiln equipment, etc.

Ont., Toronto — Remington Typewriter Co., Ltd., 146 King St. W.—equipment, motors and machines for manufacture of typewriters.

Ont., Toronto—Willys-Overland Co., Ltd., Weston Rd.—equipment for garage and repair shop.

Que., Lachute Mills—E. Charlebois, Box 59 — machinery for the manufacture of sash and doors.

Que., Montreal—H. McGarr, 52 Drummond St.—complete equipment for public garage and service station.

Que., St. Octave de Metis—A. L. Landry —mortiser and other equipment for the manufacturing of sash and doors.

Que., St. Valere de BuLetrode — A. Binette—complete equipment for sash and door manufacturing. Estimated cost $15,000.

Opportunities for Future Business

Calif., Beverly Hills—Payne Furnace & Supply Co., 162 North Los Angeles St., Los Angeles, plans the construction of a factory on 3rd St. Cost will exceed $100,000.

Calif., Emeryville — Stewart Mfg. Co., 4071 Hollis St., manufacturers of hardware and accessories, is having plans prepared for the construction of a factory. Estimated cost $40,000. Miller & Warnecke, 1404 Hollis St., Archts.

Calif., Los Angeles—Auto Sheet Metal Works, 2003 South Main St., awarded the contract for the construction of a 1 story, 100 x 100 ft. factory on South Park St. Estimated cost $12,000 to $16,000.

Calif., Los Angeles—The City is having plans prepared for the construction of Garfield Senior High School, including mechanical arts building, administration building and work shops, at 6th and Francis Sts. Cost will exceed $500,000. G. Lindsey, Laughlin Bldg., Archt.

Calif., Los Angeles—Corondolet Fireproof Garage Co., Corondolet St., awarded the contract for the construction of a 9 story, 100 x 123 ft. garage. Estimated cost $400,000.

Calif., Los Angeles—Hamm & Grant, Inc., 607 Ferguson Bldg., Engineers, is building a 1 story, 75 x 140 ft. factory at 61st St. and Central Ave., for Monarch Screen & Mfg. Co. Estimated cost $15,000.

Calif., Los Angeles—C. W. Irwin, 352 South Westminster St., is having plans prepared for the construction of a 9 story, 85 x 175 ft. garage on South Hope St. Estimated cost $450,000. Noerenberg & Johnson, Railway Bldg., Archts.

Calif., Los Angeles—Koehl & Sons, Inc., 652 South Anderson St., manufacturers of sash and doors, is receiving bids for the construction of a 2 story, 40 x 100 ft. annex to factory. R. D. King, 519 Van Nuys Bldg., Archt.

Calif., Los Angeles—The Master Service Co., 1510 West 8th St., awarded the contract for the construction of a 1 story, 75 x 276 ft. automobile repair shop on Whittier St. Estimated cost $45,000.

Calif., Los Angeles—E. H. Metz, 1245 Formosa Ave., Hollywood, awarded the contract for the construction of a 1 story, 60 x 100 ft. woodworking plant on Rosslyn St.

Calif., Los Angeles — Sunset Sanitary Mfg. Co., have awarded the contract for the construction of a 1 story and 130 x 140 ft. foundry, East 62nd St. Cost $65,000. Austin Co. of California, 777 East Washington St., Los Angeles, Archts. and Contractors.

Calif., Los Angeles—Western Machinery Co., 900 North Main St., manufacturers of gas, distillate, kerosene, heavy oil engines, plans the construction of a plant. Estimated cost will exceed $250,000.

Calif., Oakland—National Electric Sign Co., 510-18th St., is having plans prepared for the construction of 1 story, 100 x 100 ft. shops at 30th and Myrtle Sts. Austin Co., Santa Fe Bldg., San Francisco, Archt.

Calif., San Diego—A. W. Mitchell, c/o J. & D. Parkinson, Title Insurance Bldg., Los Angeles, Archts., is having plans prepared for the construction of a 2 story, 100 x 200 ft. garage.

Calif., San Francisco—G. A. Clough, Monotype Co., 560 Mission St., awarded the contract for the construction of a 2 story loft and factory at Hawthorne and Folsom Sts. Estimated cost $43,000.

Calif., San Francisco—Folsom St. Iron Works, Folsom and 17th Sts., awarded the contract for the construction of a 1 story foundry. Estimated cost $10,500.

Calif., San Francisco—Gay Engineering Co., 311 California St., manufacturers of refrigerating machinery, plans the construction of a 1 story factory on 4th St. Estimated cost to exceed $40,000.

Calif., Santa Ana—Calawon Steel Co., c/o J. E. Lonngren, Merritt Bldg., Los Angeles, plans the construction of a factory. Estimated cost $100,000.

Conn., East Berlin—W. W. Mildrum Jewel Co., awarded the contract for the construction of a 2 story, 36 x 70 ft. factory. Estimated cost $40,000. Noted Nov. 13.

Ill., Chicago—Foote Bros. Gear & Machine Co., 215 North Curtis St., is building a new addition to their plant on Lake St., to be used for shipping, receiving and raw material storage.

The Weekly Price Guide

Rise and Fall of the Market

Iron and Steel—Firmness continues in the pig-iron market, with No. 2 fdry., Southern, about 50c. per ton above a week ago. Nearly all items on the steel list have advanced during the week. Iron and steel scrap rising. The principal hot-rolled products are $2 per ton higher than last week at Pittsburgh mills. Bars are now $2@$2.10; shapes, $1.89@$2.10 and plates, $1.75@$1.90 per 100 lb., Pittsburgh. Bars and plates are 10c. per 100 lb. higher than on Nov. 14.

Non-Ferrous Metals—Tin is strong with prices about ½c. per lb. above level of Nov. 14 in New York warehouses; foreign markets quiet. Trading trifle slower in copper, lead, zinc and antimony. Fabricated brass and copper products up ¼ to ½c. per lb. in New York and Cleveland warehouses. Old metals higher.

Linseed Oil—Raw oil (5 bbl. lots) now $1.14 per gal., f.o.b., New York, against $1.12, last week.

(All prices as of Nov. 21)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$22.05
Northern Basic	21.77
Southern Ohio No. 2	22.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	25.10
BIRMINGHAM	
No. 2 Foundry	18.50@19.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	22.84
Virginia No. 2	29.75
Basic	21.75
Grey Forge	21.75
CHICAGO	
No. 2 Foundry local	20.50
No. 2 Foundry, Southern (silicon 2.25@2.75)	24.50
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	22.77
Basic	22.77
Bessemer	23.77

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.75
Cleveland	4.75@5.00
Cincinnati	5.00@7.50
New York	5.00@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	New York	Cleveland	Chicago
No. 10	2.60@2.70	3.89	3.45	3.80
No. 12	2.70@2.80	3.94	3.50	3.95
No. 14	2.80@2.90	3.99	3.55	4.00
No. 16	3.00@3.10	4.09	3.65	4.10
Black				
Nos. 17 and 21	3.25@3.35	4.40	4.15	4.55
Nos. 22 and 24	3.30@3.40	4.45	4.20	4.55
Nos. 25 and 26	3.35@3.45	4.50	4.25	4.60
No. 28	3.40@3.50	4.60	4.35	4.50
Galvanized				
Nos. 10 and 11	3.50@3.60	4.60	....	4.60
Nos. 12 and 14	3.60@3.70	4.70	....	4.70
Nos. 17 and 21	3.90@4.00	5.00	....	5.00
Nos. 22 and 24	4.05@4.15	5.15	3.00	5.15
No. 26	4.20@4.30	5.30	4.15	5.30
No. 28	4.50@4.60	5.60	5.45	5.50

WROUGHT PIPE (Welded)—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	56%	43%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	53%	40%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4%; class A, plus 23%. Cast iron, standard sizes, 36% off.

Size, Inches	List Price per Foot	Diameters Inches — External	Diameters Inches — Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ⅛-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
⅛	$0.09	50%	¾	$0.16	35%
¼	.11	45%	1	.18	31%
⅜	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.20
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.85	8.00	6.55
Hoop steel	4.49	4.35	4.15
Cold rolled strip steel	7.00	8.25	7.15
Floor plates	5.55	4.60	5.50
Cold drawn shafting or screw	4.05	3.90	3.80
Cold drawn flats, squares	4.55	4.40	4.30
Structural shapes (base)	3.34	3.20	3.10
Soft steel bars (base)	3.24	3.10	3.00
Soft steel bar shapes (base)	3.24	3.11	3.00
Soft steel bands (base)	3.99	3.20	3.65
Tank plates (base)	3.34	3.42½	3.10
Bar iron (2.90@3.00 at mill)	3.24	3.21	3.00
Tool steel	11.00	....	....
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, 3/32, 8.25c.; ⅛, 7.75c.; 5/32 to ½, 7.25c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			14.50
Tin, 5-ton lots, New York			55.50
Lead (up to carlots), St. Louis	8.40@8.85	New York	9.50
Zinc (up to carlots), St. Louis	6.80@6.85	New York	8.00

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	27.20	28.00	28.50
Antimony (Chinese), ton spot	16@16.50	14.00	10.00
Copper sheets, base	21.37½	21.12½	23.00
Copper wire, base	19.37½	19.50	21.75
Copper bars, base	20.62½	21.37½	22.50
Copper tubing, base	23.75	24.25	25.75
Brass sheets, base	18.12½	18.00	19.75
Brass tubing, base	22.50	23.50	28.25
Brass rods, base	16.12½	17.12½	17.50

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass wire, base	18.62½	19.00	20.25
Zinc sheets (casks)	11.00	11.50	.....
Solder (½ and ½), (case lots)	39@40	34.00	30.00
Babbitt metal (83% tin)	60.00	64.50	48@52
Babbitt metal (35% tin)	28.00	19.50	23@26
Nickel (ingots) f.o.b. refinery	29.00	.....	.....
Nickel (electrolytic) f.o.b. refinery	33.00	.....	.....
Nickel (F shot) f.o.b. refinery	30.00	.....	.....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Rolled nickel sheet (base)	52.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00
Manganese nickel hot rolled rods "E"—low manganese (base)	54.00
Manganese nickel hot rolled rods "D"—high manganese (base)	57.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible heavy copper	11.50@11.75	10.50	11.00
Copper, heavy, and wire	11.25@11.50	10.25	10.50
Copper, light, and bottoms	10.00@10.25	9.50	9.50
Heavy lead	7.00@7.25	6.50	7.00
Tea lead	6.00@6.25	5.00	5.50
Brass, heavy, yellow	7.25@7.50	6.75	7.00
Brass, heavy, red	9.00@9.25	8.50	8.50
Brass, light	6.25@6.50	5.75	6.00
No. 1 yellow rod turnings	7.75@8.00	7.00	7.00
Zinc	4.00@4.25	3.75	3.50

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$23.50	$22.85	$21.00
"A" Grade:				
IC,	20x28, 112 sheets	19.00	18.80	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	13.00	13.00	12.75
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	7.25	6.80@6.90	6.50@6.75

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.14@0.21	$0.19	$0.14
Cotton waste, colored, per lb.	.09@.14½	.18	.10½
Wiping cloths, 13¼x13¼, per lb	11.00@11.25*	36.00 per M	.16
Wiping cloths, 13¼x20½, per lb.	....	50.00 per M	.16
Sal soda, per 100 lb. keg	2.25	2.25	2.65
Roll sulphur, per 100 lb. keg	3.60	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	1.14	1.15	1.05
Lard cutting oil, 25% lard, per gal.	.55	.50	.32
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	.29	.35	.21
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft. per inch of width for single ply.			
Medium grade	40–2½%	30–10%	30–10%
Heavy grade	30–5%	30%	20–5–2½%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50%	50–10%	40–10%
Second grade	50–10%	60–5%	60–5%

*White, at washery.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0354
Cold finished shafting	per lb.	.0405	.0405	.0465
Brass rods	per lb	.1612½	.1462½	.155
Solder (½ and ½)	per lb.	.39@.40	.37@.38	.31
Cotton waste	per lb.	.14@.21	.14@.21	10@13
Washers, cast iron (½ in.)	per 100 lb.	6.50	6.50	6.50
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.38	3.38	3.38
Lard cutting oil	per gal.	.55	.55	.55
Machine oil	per gal.	.29	.29	.297
Belting, leather, medium	off list	40–2½%	40–2½%	30–10%
Machine bolts up to 1x30 in.	off list	45%	45%	40–10%

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
Flint paper	$4.86	$5.84	$6.48
Emery paper	10.71	11.00	8.80
Emery cloth	28.00	31.12	29.48
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20
Fire clay, per 100 lb. bag	.....	.65	.60
Coke, prompt furnace, Connellsville	per net ton		3.10@3.15
Coke, prompt foundry, Connellsville	per net ton		4.00@4.50
White lead, dry or in oil	100 lb. kegs	New York, 15.25	
Red lead, dry	100 lb. kegs	New York, 15.25	
Red lead, in oil	100 lb. kegs	New York, 16.75	

SHOP SUPPLIES

	New York	Cleveland	Chicago
Rivets: Button heads, ¾-in., ⅞-in., 1x2-in. to 5-in., per 100 lb.	$5.00	$3.50	$3.50
Cone heads, ditto	5.20	3.60	3.70
Washers, cast iron: ½-in. per 100 lb.	6.50	4.00	3.75
⅝-in., per 100 lb.	5.50	4.00	3.75

Machine bolts, up to 1x30-in., with cold punched and hot-pressed hex. nuts, also button head bolts with hex. nuts are $3.50 per 100 lb. at Cleveland. Tap bolts with hex. heads are $4.65 per 100 lb. at Chicago.

Machine bolts, ¼x1½-in., per 100, $1.70. Discount at New York warehouses on all sizes up to 1x30-in., 45%; 1½ and 1¼x3-in. up to 12-in., 15%; with cold punched hex. nuts up to 1-in. dia. (plus std. extra of 10%) 35%; with hot pressed hex. nuts up to 1x30-in. (plus std. extra of 10%) 40%.

Carriage bolts, ¼x1½-in., per 100, $1.00. Discount on all sizes up to 1x30-in., 35%.

Coach and lag screws, 1½x-⅝in., $2.25 per 100, less 45%.

Tap bolts, 1½x½-in., $1.00 per 100. List plus 35%.

Bolt ends, 1x12-in., 10c. per lb., less 45%.

Nuts, semi-finished, ½x½-in., 2c. each. Discount 70% for ⅝-in. and smaller and 65% for ¾-in. and larger.
Case hardened, ½x½-in., 6c. each, less 50%.

Rivets, ⅛x1-in. and longer, 19c. per lb., less 60%. Same discount for tinned. EXTRA per 100 lb. for 1½ to 2-in. long, all diameters, 25c.; ⅝-in. dia., 35c.; ¾-in. dia., 75c.; 1-in. long and shorter, 75c.; longer than 5-in., 50c.; less than 200 lb., 50c.; countersunk heads, 45c.

Ill., Macomb—American Steel Products Co., awarded the contract for a 1 story, 28 x 112 ft. addition to plant.

Ill., Mount Vernon—Mount Vernon Car Mfg. Co. awarded the contract for the construction of a 1 story, 303 x 478 ft., plant.

Ill., Pittsfield—Brun Mill Co., is having preliminary plans prepared for the construction of a 2 story, 30 x 160 ft. mill. Estimated cost $50,000. Private plans.

Kan., Wichita—Wichita Railway & Light Co., 1113 Main St., is having preliminary plans prepared for the construction of a 1 story bus garage and shop. Estimated cost $60,000. Private plans.

La., Campti—Frost Johnson Lumber Co. awarded the contract for the construction of a single band saw mill to replace mill destroyed by fire. Estimated cost $50,000.

Me., Oldtown—Wing & Eagle Box Co., plans the construction of a box factory. Estimated cost $75,000.

Me., South Portland, (Portland P. O.)—Knightville Garage, B St., is having plans prepared for the construction of a 3 story, 100 x 100 ft. garage. Estimated cost $200,000. O. I. Emerson, 141 Sawyer St., Portland, Archt.

Md., Baltimore—Parker Metal Decorating Co., E. A. Parker, Pres., Howard and Ostend Sts., has awarded the contract for the construction of a 1 story, 42 x 135 ft. factory. Estimated cost $60,000. Noted Nov. 6.

Md., Baltimore—The Standard Sanitary Mfg. Co., Bessemer Bldg., Pittsburgh, Pa., awarded the contract for the construction of a 5 story, 158 x 75 ft. mill on 5th Ave. near B. & O. R.R. Estimated cost $150,000.

Mass., Boston—Wood Hydraulic Hoist & Body Co., 3371 Washington St., plans the construction of a new plant at 316 North Beacon St. Estimated cost $40,000 with equipment. Architect not selected.

Mass., Cambridge (Boston P. O.)—J. J. Shine, 1374 Massachusetts Ave., plans the construction of a 1 story, 250 car garage and repair shop at 410-438 Green St. Estimated cost $150,000. Architect not selected.

Mass., Dorchester (Boston P. O.)—S. Shoolman, Rm. 1114 Tremont Bldg., awarded the contract for the construction of a 1 story, 300 x 80 ft. repair and service garage, at 1256 Blue Hill Ave., here. Estimated cost $100,000.

Mass., Lynn—Sprague Breed, Stevens & Newhall, Central Sq., is receiving bids for the construction of a 1 story, 70 x 140 ft., repair and service garage. Estimated cost $40,000. Sanborn & Weed, Item Bldg., Archts.

Mass., New Bedford — E. Caswell, 490 Pleasant St., is having plans prepared for the construction of a 2 story, 125 x 140 ft. garage at High and North Concord Sts. Estimated cost $175,000. F. T. Hammond, Archt.

Mass., Worcester—Sarkin Malkasion, 49 Forbes St., is having plans prepared for the construction of a 1 story repair and service garage on Hitchcock St. Estimated cost $40,000. J. Rustigian, 405 Main St., Archt.

Mich., Flint—Peoples Coach Co., 3rd & LaBelle Ave., Highland Park, Detroit, awarded the contract for the construction of a 1 story, 160 x 130 ft. garage and storage for motor buses on East Kearsley St. Estimated cost $100,000.

Minn., Duluth — Acme Match Corp., Lyceum Bldg., awarded general contract for the construction of a 2 story, 89 x 146 ft. match factory at 40th Ave., West and Traverse St. Estimated cost $60,000.

Mo., St. Louis—Kaysing Structural Iron Co., 2710 North 25th St., plans the construction of a 2 story iron plant at 17th and Clinton Sts. Estimated cost $50,000. Private plans.

N. Y., Buffalo—The Amer. Radiator Co., 1 Austin St., is having plans prepared for the construction of a core building. Estimated cost $60,000.

O., Cleveland — The Bourne, Fuller Co., (iron and steel), M. H. Hopkins, Secy., Hanna Bldg., awarded the contract for the construction of a 4 story, 70 x 170 ft. factory on Scranton Rd. Estimated cost $200,000. W. Brown, Archt. and Engr.

O., Cleveland—The City, E. D. Barry, Dir. Public Service, City Hall, is having plans prepared for the construction of a 1 story, 170 x 191 ft. garage on Dell Ave Estimated cost $150,000. H. Kregelins, City Hall, Archt.

O., Cleveland — The Fairmount Tool & Forging Co., 10611 Quincy Ave., awarded the contract for a 2 story, 50 x 32 ft. addition to factory. Estimated cost $40,000.

O., Cleveland—G. W. Hale, Alcazar Hotel, Cleveland Heights, plans the construction of a 2 or 3 story public garage on Bolivar Rd. Estimated cost $150,000. Architect not selected.

O., Cleveland—The P. J. Spitz Co., P. J. Spitz, Pres., Swetland Bldg., plans the construction of a 1 and 2 story, 80 x 189 commercial garage at 2708 Euclid Ave. Estimated cost $150,000. Nicola Petti, Williamson Bldg., Archt.

What This Section Is

Machinery Requirements and Industrial Construction is a reliable machinery market, because every item is reported first-hand by our own correspondents, scattered over the United States and Canada. These leads are verified by our men. We do not use newspaper clippings, nor do we listen to any hearsay or rumors. These sales leads are as accurate as our men can make them, and as timely as weekly publication will permit.

This market is for *American Machinist* subscribers. It covers the same machinery fields as does the paper. Here will be found inquiries for machine tools, presses, hammers, welding, forging and heat treating equipment, wood working machinery, cranes, hoists and other material handling machinery for the shop.

Here also will be found reports of proposed industrial construction, where sooner or later machinery will be needed.

Are you making the most of the opportunities listed here?

O., Columbus—J. W. Coulson & Co., 95 West Spring St., J. H. Weiser, Gen. Mgr., manufacturers of patented store fronts, is having plans prepared for the construction of a 4 story, 150 x 34 ft. and 51 x 68 ft. factory at 150 North 5th St. Estimated cost $40,000.

O., East Cleveland—Rowell Building Co., c/o W. Howell, Guardian Bldg., awarded the contract for the construction of a 1 story, 100 x 140 ft. public garage at 1146 Euclid Ave. Estimated cost $150,000.

Okla., Bartlesville—Vinita, Bartlesville & Western Ry., is having preliminary plans prepared for car and locomotive repair shops to be operated in connection with line from Vinita to Blackwell. Site not selected.

Okla., Oklahoma City—Hughes Tool Co., 300 Hughes St., Houston, Tex., is having preliminary plans prepared for the construction of a machine shop for the manufacture of oil field supplies, lathes, drills, presses, etc., on West 23rd St. Estimated cost $65,000.

Pa., Kenneth Square — American Road Machine Co., Commercial Trust Bldg., Philadelphia, will soon award contract for the construction of a 1 story, 158 x 132 ft. factory. W. Steele & Son, 219 North Broad St., Philadelphia, Engrs.

Pa., Philadelphia—E. G. Budd Mfg. Co., 25th St. and Hunting Park Ave., manufacturers of automobile bodies, awarded the contract for a 1 story, 30 x 60 ft. addition to plant on Stokley St. north of Westmoreland Ave.

Pa., Philadelphia—Factory—Die Casting Co., 9th St., has awarded the contract for the construction of a 1-story and basement, 60 x 150 ft. factory. Estimated cost $40,000.

Pa., Philadelphia—A. H. Fox Gun Co., 18th and Indrim Sts., awarded the contract for the construction of a 1 story and basement, 90 x 162 ft., factory on 18th and Wagner Sts. Estimated cost $60,000.

Tenn., Nashville — Nashville Chair Co., 116 Public Sq., awarded the contract for the construction of a factory at 1st and Boscobek Sts. Estimated cost $40,000.

Tex., Dallas—American Body Co., 2800 Williams St., is having plans prepared for the construction of a 1 story, 120 x 225 ft. factory on East Grand Ave. Estimated cost $45,000. A. A. Brown, Western Indemnity Bldg., Archt.

Tex., Houston—W. Cameron & Co., Waco W. Cameron, Pres., will soon receive bids for the construction of a sash, door and trim factory on Texas Ave. Estimated cost $150,000. Private plans.

Wash., Seattle—The Bon Marche, 2nd and Union Sts., MacDougall-Southwick Co., 2nd and Pike Sts., Fraser-Patterson, 2nd and University Sts., and Rhodes Co., 1321 2nd St., plan the construction of a 7 story, 150 x 110 ft. garage, service and repair shop to accommodate 500 cars.

Wis., Fond du Lac—The Sanitary Refrigerator Co., plans a 1 story, 100 x 100 ft. addition to its plant. Estimated cost $100,000 including equipment.

Wis., Madison—The Jacobson Auto Co., 207 East Washington Ave., awarded the contract for the construction of a 3 story, 90 x 125 ft. garage and repair shop at 331-337 West Gorham St. Estimate cost $80,000.

Wis., Manitowoc—Aluminum Goods Mfg. Co., 15th and Franklin Sts., G. Vits, Pres., has awarded the contract for a 7 story and basement, 60 x 300 ft., warehouse and manufacturing plant on Franklin St. Estimated cost $350,000.

Wis., Milwaukee—Cordes Supply Co., 69 2nd St., manufacturers of plumbing and heating supplies, plans the construction of a 2 story shop and warehouse on St. Paul Ave. Architect not selected.

Wis., Milwaukee—B. Hoffmann Mfg. Co., 1809 St. Paul Ave., manufacturers of valves and iron pipe, awarded the contract for a 1 story, 57 x 170 ft. addition to factory. Estimated cost $20,000.

Ont., Port Elgin—Stevens Hepner Co., manufacturers of brushes and brooms, plans an addition to their factory. Estimated cost $35,000.

Ont., Toronto—Bd. Education, 155 College St., plans the construction of a 3 story 20 or 25 room branch technical school on Jane St. Estimated cost $250,000. C. Dyson, Archt.

Ont., Toronto—Booke Mfg. Co., Dartnell Ave., having plans prepared for the construction of a planing mill and lumber yard. Estimated cost $200,000. Private plans.

Ont., Toronto—Remington Typewriter Co., Ltd., 146 King St. W., plans the construction of a typewriter factory. Estimated cost $200,000. Architect not selected.

Ont., Toronto—Willys-Overland Co., Ltd., Weston Rd., awarded the contract for the construction of a 2 and 3 story, 60 x 100 ft. garage and service station at Bay and Breadalkane Sts. Estimated cost $150,000.